THE SCIENTIFIC AND LITERARY REVIEW,

AND RECORD OF PROGRESS IN ARTS, INDUSTRY, AND MANUFACTURES,

INCORPORATING THE

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NEW SERIES.

*** *Communications to the Editor to be addressed to him at 21, Cockspur Street.*

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The various efforts which have been made, and the numerous influences now at work to injure, if not to destroy, Patent Rights; the inefficiency of the many well intended, but ill considered, schemes of Patent Law Reform which have from time to time been suggested, and the tendency of which has generally been to prejudice the Inventor, without advantage to the Public; together with the proceedings so essentially involving the interests of inventors which have already taken place in Parliament, show the necessity of an immediate and active co-operation on the part of those interested in Inventions and in Patent Property, and that an Association for the Protection and Defence of Patent Rights is urgently needed. This Institute has, therefore, been established for the purpose of uniting and organising the influence of Inventors, Patentees, and others. Its objects are:—

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APPLICATIONS FOR LETTERS PATENT.*

On November 1st.—3233 to 3246.—J. R. Harper. Gas-lamp blow-pipe apparatus, part of such improvements being applicable to other spirit-lamps.—C. A. de Laskarzewski. Manufacture of pianofortes.—E. Knowles. Looms for weaving.—G. G. Picking and W. Hopkins. Construction, arrangement, and working of steam cylinders for use in steam pumping machinery and in steam engines.—J. Speirs. Looms for weaving gauze fabrics.—L. Binns. Manufacture of endless bands, cords, or ropes, and in machinery or apparatus to be employed therein.—W. R. Lake. Machinery or apparatus for bending or curving soft-metal tubes (com.)—G. H. Bolton. Method of and apparatus for applying heated air to economise the heat of steam boiler and other furnaces, and for similar purposes.—F. Hurd and E. T. Simpson. Machinery or apparatus for excavating coal and other minerals, and for expanding the air for driving such machinery, and for other purposes.—J. Haworth. Construction of tramways.—J. Teer. An improved mode of and apparatus for generating steam, and for consuming smoke.—P. A. Desjardin. Metallic alloys, applicable where cotton, tin, zinc, brass, Muntz's metal, and other like metals and alloys are now used.—W. Andrews. Sewing machines.—A. Clark. Manufacture of corrugated metal revolving shutters, and in machinery for the same.

On November 2nd.—3247 to 3263.—E. T. Davies. Gigs and other vehicles.—B. W. Davis and J. Pardoe. Construction of cylinder printing machines.—J. Winne and J. R. Winne. Means or apparatus for corrugating zinc plate for use in the manufacture of what are called washing frames or boards.—P. Forbes. Means or apparatus for the preservation of substances for food.—J. Vivian and H. S. Mackenzie. Self-indicating weighing and strain-testing machinery.—E. Withy and W. Gibson. Mixing, charging, and smelting iron ores.—A. B. Blackburn. Apparatus for heating and lighting.—J. Weems. Gas meters and gas generators.—J. McMurray. Strainers for straining paper pulp.—T. Walker. Fastenings for scarfs, ties, cravats, and other articles of dress.—F. A. Braendlin. Breech-loading small-arms.—N. J. Gateuil. Apparatus for effecting calculations.—J. A. Longridge. Locomotive engines.—J. Parks. Fixing salt-pans, and in arranging the furnaces under the same.—J. A. Wanklyn. Production of oxygen gas.—G. Zanni. Magneto-electric railway block and other day or night signalling instruments or apparatus, and in means for communicating signals from one part of a railway train to another.—F. G. Marchant. Shoes for horses and other animals, and in fastenings for the same.

On November 4th.—3264 to 3274.—A. J. Reynolds. Submerged force-pumps (complete speci-

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* "(Com.)" means "Invention communicated from abroad."

BRITISH MUSEUM

fication).—J. U. Burt. Apparatus for opening and closing the heads of landaus, barouches and other open carriages.—W. E. Everitt, Machinery or apparatus to be used in the manufacture of metallic tubes.—J. Blakey. Machinery or apparatus for paring and finishing the edges of soles and heels of boots and shoes.—A. Prince. Tubular steam generators (com.)—G. G. Goldsmith and J. Dilkes. Means of and apparatus for removing obstructions from gas pipes.—C. Rave. Extraction of a colouring matter astringent similar to the Indian cashoo.—W. Bennett. Automatic apparatus for the differential adjustment, reduction, and regulation of pressures, either of fluids, steam, or gases.—J. R. Williams. Cements.—J. B. Spence. Obtaining anthracene and in apparatus connected therewith (com.)—H. D. Plimsoll. Miners' safety lamps.

On November 5th.—3275 to 3284.—G. King. Apparatus used in the manufacture of gas.—G. S. Burton. Pincushions.—R. J. Lee. Inhaling apparatus, applicable also for heating medical baths.—W. Glazier. Treating and utilising certain refuse animal and vegetable substances, and the application of the resulting substances or matters to various manufactures.—J. McIntyre. Governors for steam engines.—M. J. Roberts. Stuffing boxes and pistons, and in making pipe joints.—H. D. Plimsoll. Miners' safety lamps.—E. Milner. Means or apparatus for the treatment of smoke from steam boiler and other furnaces.—J. Law and S. Law. Cards for carding woollen, cotton, silk, and other fibres.—J. F. Belleville. Steam boilers and furnaces and in parts connected therewith.

On November 6th.—3285 to 3298.—W. Basford. Manufacture of bricks and tiles.—T. R. Horton. Apparatus to be used in the manufacture of Bessemer and other steel, some of which improvements are also applicable in other operations requiring lifting apparatus.—P. Jones. Communicating between the passengers, guard, and engine-driver upon railway trains.—H. Harrison. Manufacture of artificial or prepared fuel from anthracite dust or "culm," or from other coal dust.—R. Hornsby, J. E. Phillips, and J. Innocent. Reaping and mowing machines.—E. Grether. Machinery or apparatus for sizing and dressing yarn.—B. Looker. Fire-grates, stoves, or fire-places.—E. J. W. Parnacott. Artificial fuel, part of which improvements having reference to the means or apparatus employed in the manufacture of the same.—I. Evans. Combined envelopes and letter paper, memorandum paper, note paper, invoice and account heads, a part of which improvements is also applicable to covers and envelopes for postal and other purposes.—C. Toft. Holding or suspending the lids or covers of vegetable dishes, which is applicable also to other covered vessels.—C. E. Parlin and J. O. Turner. Boot or shoe heel (com. Complete specification.)—T. H. Symonds. Machinery or apparatus for glazing or polishing enamelled and coloured papers.—J. Richards. Marking instruments (com.)—E. H. Bentall. Steam boilers.

On November 7th.—3299 to 3309.—W. R. Lake. Electric torches for lighting gas (com.)—G. H. C. Hedley, W. Smith, and T. A. Hedley. Manufacture and purification of gas, and in the apparatus employed therein and connected therewith.—F. H. Wilke. Power looms.—A. L. Kiesling. Apparatus for warming railway and other carriages, and in the manufacture of the fuel to be used therein.—T. Laycock and J. Shuttleworth. Construction of spools for the shuttles of sewing machines, and in the mode of winding the thread thereon (Complete specification).—J. Ruston. Portable and other steam engines.—G. L. Turney. Boxes and in machinery for manufacturing the same.—H. Page. Manufacturing paper pulp or half stuff.—J. E. Outridge. Valves for steam and other engines.—M. Rae. Production of artificial fuel and in the machinery employed therein.—H. Deacon. Manufacture of bleaching liquor.

On November 8th.—3310 to 3323.—J. S. Crosland. Stationary and marine steam boilers or generators.—J. D. Lee and J. White. Construction of ships and vessels.—S. K. Ibbetson. Manufacture of cigarettes.—J. Smith. Fire-grates and chimneys.—H. Brooks. Music stools or chairs, which improvement is also applicable to other seats and articles of furniture the height of which is required to be variable (com.)—J. Tebbutt. Manufacture of

(*Continued on page* 14.)

THE INVENTORS' PATENTRIGHT ASSOCIATION,

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When an Inventor, after, it may be, years of thought and labour, has brought into practical shape the product of his brain, he is, perhaps, assailed with doubts as to the novelty or commercial utility of his invention; he knows little of the process by which his rights in it are to be secured, and he feels some natural apprehension about confiding to mere agents that which has cost him so much, and which, once revealed, may be so readily appropriated by others.

The Inventor, having legally protected his invention, requires influence, capital, and publicity, in order that he may turn it to profitable account. Before he can secure the aid of capitalists or of public bodies, he must establish to their satisfaction that his invention is novel, practicable, and duly protected by law. Its having passed through the hands of a Patent Agent, whatever his position and repute, is no proof that it fulfils those conditions, for the Agent's business is to pass an invention through the proper legal forms without necessarily paying regard to its novelty or utility.

When an invention, fully protected, has been brought into use, and especially if it be one of great value, it is subject to infringement and evasion. The Inventor, frightened at the anxiety and expense of legal process, too often allows infringement to go on, and suffers himself to be robbed of most valuable property, for want of some organised system of defence, to which he may have recourse. He may, it is true, obtain legal assistance, but he cannot, without difficulty, procure from the skilled and experienced such evidence and advice as are necessary for defending his rights against invasion.

Several leading members of the Inventors' Institute, coming daily in contact with Inventors, whose wants and difficulties are daily pressed on their attention, have formed themselves into an association, entitled "The Inventors' Patentright Association, Limited," in order to supply Inventors with the best and most reliable information and advice—to provide skilled references on questions of science and manufacture—to render legal process for protecting and maintaining patentrights safe, cheap, and ready—and to aid inventors in bringing their Inventions into practical and profitable shape. To carry out these views, the Inventors' Patentright Association have set before themselves the following objects:

Objects of the Association.

To obtain Patents for Inventions in this and other Countries.

To Register Designs.

To Sell, and License Patented Inventions.

To form Public Companies, or otherwise arrange for the Public introduction of Patented Inventions.

To furnish Advice and Professional Assistance in developing inventions.

To collect Evidence, arrange Arbitrations, and otherwise assist Inventors in maintaining their rights.

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In order to obtain Provisional Protection, the Inventor should forward to the Secretary full particulars of the Invention, together with a model or rough pen-and-ink sketch, if the Invention be a mechanical one; also a statement of the features of novelty which the Invention possesses.

With all applications for Provisional Protection, either a Provisional or a Complete Specification must be filed at the Government Office. The usual course is to file a Provisional Specification, in which case drawings are seldom required. The Complete Specification must, however, be filed within six months from the date of Provisional Protection; and, if the Invention be a mechanical one, must be accompanied by drawings fully illustrating and explaining it in all its details.

Generally, the personal attendance of an Inventor in London is unnecessary; the transmission to the Secretary of full particulars of an Invention, together with a model or rough pen-and-ink sketch is, in most cases, sufficient.

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Scientific and Literary Review,

AND RECORD OF PROGRESS IN
ARTS, INDUSTRY, AND MANUFACTURES,
INCORPORATING THE
JOURNAL OF THE INVENTORS' INSTITUTE.

JANUARY 1, 1873.

PROPOSED ALTERATIONS IN THE *SCIENTIFIC REVIEW.*

TO OUR READERS.

FOR some time we have contemplated an alteration in the character and contents of the SCIENTIFIC REVIEW, which we are persuaded will be approved of by our subscribers generally. In our reviews and notices of books we have hitherto almost exclusively confined our attention to works treating of scientific subjects, though we have frequently questioned ourselves as to the propriety of shutting out other book notices, which we were convinced could not fail to be very interesting to our readers.

After mature consideration we have decided to deal more liberally, and we think more judiciously, with general literature, and we have decided to do this in the interests of science.

We can no longer shut our eyes to the fact that the investigations of science penetrate into every walk of life. The business, the arts, and even the amusements of life are at the present day almost necessarily scientific. Pure scientific investigation for its own sake is far more common than ever. But scientific experiments and applications shoot out in all directions from these. No branch of the fine arts can be pursued so as to secure high results unless its details are worked out with scientific accuracy, and by aid of scientific knowledge. No kind of manufacture can be successful unless every aid science can lend has been called into requisition. In the boundless fields of nature countless auxiliaries are to be found to help man in every task the duties or interests of life can impose, or the genius of investigation prompt. But on the other hand, as practical science extends the sphere of its usefulness in aid of the ordinary duties of life, so the efforts of imagination speculating on the wonders that may be realised, stimulate the activity of the discoverer and the inventor. The practical and imaginative intellect act and re-act on each other, or rather touch and intermix, until by the efforts of both, what at one time appeared the vaguest hope becomes the common prosaic fact of life. For this reason we feel that whatever is to be found in works of travel or fiction, or in the writings of our poets, should, under certain conditions of critical selection, engage the attention of the scientific reader and thinker.

The conditions of life in every one of its spheres of action may be regulated by scientific thought. It is not only in such works as constructing a steam-engine, adjusting the conditions of a railway, or providing for the electric transmission of thought, that the application of science should be looked for. The Duke of Somerset said truly the other day at Newtown Abbot that the great gains to society during the last two hundred years had been obtained chiefly by the labours of our men of science, and not by the desultory scheming of our politicians, and that the reason why Governments have failed is that statesmen have worked without any scientific foundation or calculation for their proceedings. Whether this be true absolutely or only partially, it suggests a most important question—Whether scientific thought might not be brought to bear on the work of Government in such a way as to prevent those social anomalies and disasters which afflict society at the present moment, chiefly because science and invention have given us a larger power of creating and obtaining wealth than we know how to distribute properly amongst our people by the present haphazard rule-of-thumb system in operation.

In the scientific world something useful on this subject may be struck out, and it is with this view that we have decided to enlarge the scope of our duties—to change our *Scientific Review* into a *Scientific and Literary Review*—to examine books of all sorts as depositories of thought, and to get from each whatever may enlighten, stimulate, and assist the scientific inquirer; and therefore we shall not hesitate, when the opportunity offers itself, to consider social and even political problems.

What we are already doing will be continued, but we shall endeavour to turn in upon our pages other fructifying streams of thought in connection with literature, pleasant and even useful to those engaged in scientific investigation. We shall also occasionally notice events in connection with art and the drama, so as to furnish an interesting monthly account of whatever transpires interesting to the intelligent and educated reader.

We hope our subscribers will aid us in this work by furnishing our pages with any special information they may possess.

Scientific men, artists, and others have no doubt much to communicate to each other, and will have to help each other more effectually in the future than they have in the past before, by the united efforts of all, the many improvements needed by society can be effected. It is not necessary to believe in any near approach of the Millennium to urge this co-operation of diversified thought and effort, or to hope that we can immediately restore the dissonance to harmony in society, and make the jarring individual be a chord that in the general consecration bears part with all in musical relation.

But much can nevertheless be done by well-meant and rightly-directed effort to bring about changes in which all may rejoice.

What we propose doing in the *Scientific Review* may not be much, but every service honestly rendered counts for something, and it is in this spirit that we ask our subscribers and readers to give us their support, and, where such a thing can be done with propriety, to recommend us to the attention of readers not in the fullest sense of the term scientific readers.

OUR SHIPS AND OUR GUNS.

IT was a sad day for Britain when the old faith in her wooden walls was shaken and destroyed by iron vessels supplanting our renowned hearts of oak. Not that we found any cause for regret so long as we were content to direct our attention to perfecting our naval structures by substituting iron for wood and suitably improving their form and construction by the scientific application of metal, for then all went well—vessels of less draught and greater capacity delighted and benefitted us; but presently it was suggested that our war-ships might by means of iron be made impregnable—and here our troubles began. Our military marine system was forthwith turned topsy-turvy, the object being not so much to build ships, as to erect sea-monsters that should deal out death and destruction all around, and yet be themselves unattackable, except with the almost certain result of destruction to the attacker. Of course our inventors were ready for the occasion, and much was done to carry out this *desideratum;* but no sooner was that much achieved than the idea was broached that although these structures might be impregnable when attacked by ordnance hitherto used, they could readily be made to succumb to the action of heavier artillery able to discharge more powerful and penetrating shot. Forthwith bigger guns were planned and manufactured, designed for the use of heavier and more irresistible projectiles, and again inventive genius exercised itself in armouring our ships and strengthening the structure of our vessels; whereupon another set of inventors then occupied themselves with further improving and rendering more effective our big guns, so that the dreadful sea-monsters themselves have been made to tremble at the great cannon's roar. By these proceedings, however, our vessels have been rendered so huge and unwieldy as no longer to be properly denominated ships, but floating batteries; and the big guns have grown so big and immovable as to be incapable of being worked, except by the aid of complicated mechanism. But this state of things has not daunted or dispirited our inventors, who are always ready to grapple with untoward events, and the same course of improving and improving is ever proceeding, with the old spirit. Still more gigantic ships are opposed by still more gigantic guns, and no termination of the game seems likely to ensue.

However, John Bull is beginning to grumble (some people say he always *is* grumbling), and keeps on asking, *Cui bono?*—is he to go on for ever paying the piper, and yet never witness the performance of a satisfactory dance? Are armour-plated ships to be the proper thing to-day, and improved big guns to render them of no account to-morrow? And, above all, are we not engaged in the pursuit of a will-o'-the-wisp, which is ever close to our grasp and yet ever beyond it? There must surely be a practical limit to the increase of the bulk of our ships and the size of our cannon, which can be arrived at by study and experiment without resorting to actual trials on a large scale at immense expense. It may be a grand exploit to pile Pelion on Ossa, but we regard it as one that in the end will lead to the practical result of leaving us "as you were."

We have not in the foregoing remarks taken into consideration a most important element in these matters—namely, the torpedoes or submarine projectiles, though these must be duly considered when dealing with the question of ships and guns, for it is quite clear that they will play a most important part in the maritime warfare of the future. Nor have we given any consideration to the notion that the steam cannon can be rendered a practical and powerful instrument of warfare, although we incline to the opinion that a powerful war-engine of that kind could be devised. All the matters above referred to require to be duly weighed and submitted to the test experiment before large sums are spent upon any one object; but this is not the present practice with our Government, as comes out very strongly in the case of the *Woolwich Infant*, as it is termed, upon which single cannon something like three thousand pounds was spent, and yet it failed upon the seventy-third discharge, and then, a few months' quiet interval being allowed, the *Infant* was transferred to the factories to be cut in two transversely where the B coil and B tube are hooked together, in order that the old steel barrel and cascable might be bored out and new ones substituted, and a new B coil shrunk on. For the sum of about £700 the gun is to be rebuilt and be ready to begin a new life, but whether that new life be short or long depends, if the gun be used, upon a correct appreciation of the suicidal tendencies which shortened the old one.

Thus the old, old system of trial and error seems to be the only one adopted by our Government, and we confess we have no hope that any improvement in this respect will be effected within any reasonable period of time. But it is a matter of national concern that a fair and careful consideration should be given to the question whether, due regard being had to all the circumstances of the case, any ship really can be built that will be equal to the requirements of a sea-going vessel, and at the same time will be able to resist a heavy cannonade from the biggest guns that can be used to assail it. The only reliable course seems to us to be the adoption of Captain Moody's star principle of construction, more with the view of producing a navigable floating battery than a ship, that could, if need be, have a tender accompanying it which should be a swift vessel that could act as a tug when needful.

After all, it may be well to carefully consider if this highly-expensive game of constructing impregnable vessels is worth pursuing, for nobody can say whether big guns or big ships will ultimately triumph. For ourselves, we incline to the opinion that guns for forts and batteries can be so constructed as to be perfect annihilators of any ships, however well armoured, and that any vessel in order to have any chance of resisting the action of such guns must be made so large and unwieldy as to be thoroughly unmanageable in a heavy sea; and it would seem to be a wiser course for sea-going war-ships to be built so that they are good sailers, can easily shift their position, and be armed with sufficiently powerful artillery, than to pursue this chase in search of invulnerability for them.

Reviews.

Records of the Rocks; or, Notes on the Geology, Natural History, and Antiquities of North and South Wales, Devon, and Cornwall. By Rev. W. S. SYMONDS, F.G.S. With numerous illustrations. London: John Murray, Albemarle Street.

THIS is a pleasant and instructive work, in which not only the geological structure and natural history, but also the antiquities of the districts above-mentioned are brought under the notice of its readers. It appears that the work is the result of an accumulation of notes on natural history, stored during several years when travelling on geological expeditions throughout the districts on which it treats; and the author states that it is written for amateurs who, like himself, enjoy passing their leisure hours among rocks, old castles, old authors, and the wild flowers of strange wayside places. It does not assume to be a strictly scientific description of the geological structure of the different tracts of country to which it alludes, but he trusts it is correct as far as it goes.

The volume is enriched by sketches of scenery from the pencil of the author's friend and frequent companion, Sir William Guise, Bart., and by the reproduction of many plates of landscapes, fossils, and sections from that well-known scientific work, "Siluria," by Sir Roderick Murchison.

Thanks are tendered to Miss Dora Baker, of Hasfield Court, Gloucestershire, for illustrations of some of the typical fossils; and to Miss Roberts, of Hazeldine, Red Marley, for efficient aid in carrying the MSS. through the press, and for the copious Index, which we can say is worthy of commendation.

The work opens with a general review of ancient astronomy and cosmogonic knowledge, and then proceeds to treat of Laurentian Rocks afterwards describing the Cambrian Rocks, the Lower, Middle, and Upper Silurians Old Red Sandstone, and then refers to the Devonian Rocks; and from this part of the work we quote the following:—

MIDDLE DEVONIANS.

It is not possible to examine the Combe Martin district properly without sojourning awhile in the immediate neighbourhood. The little town itself is long and irregular, with an interesting church and a fine perpendicular tower. There is good sea fishing off the cliffs, and it is by far the best locality in North Devon for collecting the fossils of the Middle Devonians, while the botanist cannot fail to obtain many interesting plants; amongst them he may see the green Laver of the epicure collected in great quantities; it is preserved for winter consumption.

Under the Little Hangman I obtained a number of well-preserved fossils in red grits; *in situ*, they occur about half-way up the cliff, and fall in masses on the shore. Among them were Stringocephalus, Burtini, Naticæ, and large Myalinæ. The junction of these beds runs up the road from Combe Martin to Knap Down Mine, but the plan to obtain good fossils is to take a boat and land under the cliffs.

Boating from Combe Martin round the Point, we see a decomposing volcanic rock traversing the slates. I could not make out whether it was a contemporaneously bedded trap, or an erupted dyke, but I expect it is the former weathering on its edges. Rounding the Headland, a red and yellow conglomerate is seen to lie between the satiny slates and the fossiliferous red rocks of the Little Hangman. A cliff path, called the Miner's Path, leads from the beach up to the summit of the cliff, from whence the explorer may walk back to Combe Martin. Some good plants flourish on the Little Hangman cliffs, and report says that the Maiden Hair fern (Adiantum Capillus Veneris) grows here in one or two localities. At all events, my boatman pointed out a light green streak which he declared was this much-coveted botanical treasure. When I was last at Combe Martin there was a good section on the road between the town and Watermouth, in the limestone and slaty rocks that pass into the Ilfracombe group. Numerous Devonian corals have been found in these beds, with trilobites and the Silurian shell Atrypa reticularis.

"It is these limestones," says Mr. Etheridge, "which so eminently characterise the Middle Devonians, and, as on the Continent, contain that peculiar group of corals totally unlike and different from those of the underlying Silurian rocks, as well as, without exception, the Carboniferous; for of the fifty species of coral known as the Middle Devonian series of North and South Devon and Cornwall, one doubtful species only is said to occur in the Silurian rocks—viz., Favosites fibrosa—and only one is said to pass up into the Carboniferous series—viz., Amplexus tortuosus—of which, however, we have no authentic evidence."

The geologist cannot do better than follow the rocks by the coast series from the bay at Combe Martin to Ilfracombe, as they are far easier to read off there than inland. Haggington Hill quarry is famous for its fossils. They include Atrypa reticularis, Rhynconella pleurodon, and Spirifers of several species. Fossils may be found at the headland of Helesborough. Mr. Valpey, a gentleman who geologised the Ilfracombe district, obtained many specimens from the Helesborough beds. Among them are some fish spines. I saw a small ichthyodorulite in some silicious beds, but unluckily broke it with the hammer. There are numerous brachiopods, but they are badly preserved; indeed I never obtained a well defined fossil from this headland.

A visit should be made from Ilfracombe to Muddiford, to examine the volcanic rock which is poured over the Morte slates, and apparently bedded with them. It consists of a greenish felstone porphyry. Another igneous rock occurs in the coast section near Rockham, between Ilfracombe and Morthoe; it may be seen by crossing the little river to the rocks at the mouth of the stream. This trap is not on the same horizon as the Muddiford or Bittadore porphyry, for that porphyry is nearer the junction of the Morte slates with the red sandstones by which they are overlaid at Swinham Down and Pickwell Down

At Rockham Bay, the Devonian Morte slates are traversed by a number of quartz veins, the result of fracture and segregation of the quartzite in the fissures. The slates are much folded, and when in a boat off Bull Point I observed a rock which looked like a dyke elevating the slates at a high angle, but I was unable to land and examine it *in situ*. These quartz veins are useful to the geologist through N. Devon, as indicating the horizon of the Morte slates, which are unfossiliferous. I have several times traced the coast section from Ilfracombe by the valley of Lee, Rockham, and Morthoe to the Woolacombe sands, but never found a fossil. The geologist may stay at the Barricane Inn when engaged in working out the Morte slates and the mooted question as to whether there is uniformity between the Morthoe and the Woolacombe slates and the overlying sandstones of Pickwell Down, Potter's Hill, and Croscombe. This may be done by carefully observing the dip of the Morte slates from Morthoe past the Barricane beach (where the beautiful blue Ianthina of the Mediterranean may sometimes be found living amongst the shells) to the place where they abut against the Woolacombe sands, and where they show signs of having their dip reversed. Not quite half-way across the sands is a stream of water which flows under Potter's Hill, and this stream occupies *a line of fault*, the Morte beds consisting of dark slates and bands of quartz, with a nearly vertical dip, being thrown off at an angle in a direction opposite to the Pickwell Down beds. I think there is here, distinctly traceable, a line of fracture between the Pickwell Down beds and the Morte slates, and that this fracture runs between the same beds at Liddon Hill, near Dulverton, many miles to the eastward. Nevertheless, as the Pickwell Down beds are seen above Venetian dipping at an angle which would carry them far over the Morte slates, the fault at Woolacombe may not interfere with the regular succession.

The church at Morthoe has "been done up," as we were assured at Barricane Inn, and for an old church is as much "done for" as new masonry, a new pulpit, and new stained-glass windows can make it, but happily the beautiful carved benches were spared, and the tomb of the Tracey. The latter is a beautiful monument, and well worthy of note. On an altar tomb of white stone, adorned with architectural work, and niches, with figures a good deal dilapidated, but of early thirteenth-century workmanship, rests a slab of black Purbeck stone, on which is an incised effigy of a man, apparently in the garb of a priest, holding in his hand the sacramental cup. The features are entirely obliterated, but on the head the outline of a peculiar cap, not unlike a coronet, is plainly traceable. Round the west and south sides of the slab an inscription is visible; as traced by Sir William Guise it may be read thus:—"Syre Guillame de Traci git ici Deu de sa alme eyt mercy." Sir William de Tracy lies here: may God on his soul have mercy! That this is the memorial of the bold slayer of Beckett may well be doubted, as the priestly habiliments and the cup of blessing are not emblematic of him; but tradition has it that he was long in hiding in these parts, where his family had possessions—which is very probable. Anyway, the effigy is one of great interest, and cannot, I believe, be of later date than early in the thirteenth century.

From a book called "Memorials of Barnstaple," which we met with at the residence of the Rev. Mr. Hall, of Pilton, we made the following extracts. "In the church of this place is a handsome monument said to have been made the depository of the remains of De Tracy, Beckett's murderer, but more generally believed to be that of a clergyman named William Tracy, who died at Morte in 1322, and who, as the title of Sir or Syre was commonly applied to the clergy at that period, had it inscribed on his tomb as a customary thing. The northern side is occupied by some armorial bearings, consisting of three escutcheons: one containing three lions passant gardant, a second three bends, and the third a Saltire."

Close by the church is a mortuary for the reception of those bodies which the sea throws up only too frequently on this dangerous coast. In the winter few weeks pass without tenants for this sad receptacle. At Morthoe I recommend the geologist to obtain a boat and examine the cliff sections (on a fine day!) off Bull Point. There are dykes of igneous rock in the slates, as well as bedded masses of a volcanic conglomerate; and the rock fissures are full of beautiful ferns in the summer time, which are almost eradicated by the eternal fern destroyers in the neighbourhood of Ilfracombe. Here also I saw a Peregrine Falcon, which bred there in 1868; the young birds were sent for hawking purposes to Oxfordshire.

The Middle Devonian rocks from the Little Hangman and Combe Martin to the base of the Pickell Down beds beyond Morthoe, are believed to be the representatives of the great coraline limestones of Plymouth and Torbay, which have furnished so many beautiful specimens to the museum of Mr. Vicary, and also of the Eifel limestone of the Continent. The Calceola schiefer is found in South Devon; and the Stringocephalus Burtini of Combe Martin is so abundant in the Rhenish Devonians as to give its name to a limestone.

The Machinery of Politics and Proportional Representation. (Reprinted from "The American Law Review," January, 1872.)

Two Essays on Proportional Representation. By Mrs. Fawcett. (Reprinted by permission from "Macmillan's Magazine.") Published by the Representative Reform Association, 9, Buckingham Street, Strand, London. 1872.

We hope our readers will not be frightened at the idea of our adding politics to the list of matters to be dealt with in the Scientific Review by our noticing these pamphlets—we have work enough to do without such an addition—but the subject dealt with in these pamphlets is one of the most important that can well be imagined from an inventor's point of view. At present the claims of inventors to efficient and inexpensive legal recognition of property in their labours is, to use a common phrase, "nowhere"; but by this means it would be possible for men who advocate their cause, and are otherwise fit men for a seat in the House of Commons, to gain entrance into that assembly. The scheme is moreover a truly scientific one, originally developed by Mr. Thomas Hare, supported by Mr. Walter Morrison, M.P., and Mr. George Howell, men eminent in the ranks of advanced Liberals. It is thus summarised by Mrs. Fawcett:—

1. All voters to be represented in Parliament.
2. Each member of Parliament to represen- an equal number of voters.
3. Each elector to have one vote.
4. Electors to be allowed to vote for any candidate.
5. Electors to be allowed to transfer their votes from one candidate to another, so that no votes are thrown away for candidates already elected, or for those who have no chance of obtaining the quota.

And those who wish to know more about the matter should read her pamphlet.

The other pamphlet is perhaps more detailed, and we can commend it as an exhaustive treatment of the whole subject; for it reviews the various systems of voting, and shows that this one has been applied with success at recent elections by ballot of members of the Board of Overseers of Harvard College (U.S.)

Colour. (Cassell's Technical Manual Series.) By A. H. Church, M.A., of Lincoln College, Oxford, Professor of Chemistry in the Royal Agricultural College, Cirencester. Cassell, Petter, and Galpin, London, Paris, and New York.

Those who want to be in possession of "quantum suff." of elementary knowledge of colour, and a good deal beyond what is elementary besides, should (unless they are already in possession of Cassell's Technical Educator) get this little work and study it.

Cassell's Technical Educator; an Encyclopædia of Technical Education. Vol. IV. Cassell, Petter, and Galpin, London, Paris, and New York.

We have in former pages expressed our favourable opinion of the preceding volumes of this work, and in now presenting to our readers this new one (which is fully equal to those previously published, and completes the series) we feel it incumbent on us to consider all the volumes together, as a whole work.

There can be no doubt that as a book of reference it will be found of great use to those persons who, without seeking to be adepts in the various arts and avocations therein treated of, find it desirable, from their trading connection with them, to possess a good acquaintanceship therewith; and, further, that some subjects are handled in a manner so definite and detailed, that artisans and others whose knowledge of the industry they practice is chiefly manual, will learn much as to the technic science appertaining to such branches of industry. Hence we are justified in recommending this work as a valuable addition to our general educational machinery, and an important aid to the advancement of knowledge in trades-science.

It may perhaps be expected in a work which deals with so many diverse matters that, whilst the treatment of some may be worthy of the highest praise, the handling of others may be entitled to some amount of blame. We can truly say that after due examination and consideration we can see little to disparage. The only point we find to be worthy of adverse criticism is the occasional use of *book-making* in the way of general disquisitions upon the present state and prosperity of an industry under consideration, and that these general and historical remarks are too much mixed up with the really technically instructive part of the essay—a not altogether trivial matter for practical men seeking for more knowledge, seeing they are compelled to wade through much that is either well-known to, or little cared for by, them. We are ready to believe, however, that this is only one of the results of the false system on which technical education seems likely to be proceeded with—namely, that those who teach technical science are not persons from the workshop who have added scientific knowledge to operative experience, but are men of science who have been mere bystanders in the workshop. It is said to be a growing opinion in politics that working men are the only reliable persons to assist the Government in dealing with the wants and wishes of working men in a satisfactory manner; and, whatever may be the real value of this as a political dogma, we hold a similar doctrine to be incontestably true as regards the efficient teaching of practical science.

Some subjects, too, are treated of which are scarcely within the range of technical education—for instance, Patent Law and Trade-Mark Law have many pages bestowed upon them, well written enough it is true, whilst Bookkeeping, which has quite as good a right to find a place in the work, is discarded altogether.

In any future editions we would suggest, in the interest of technical students, that all collateral matters, such as the historical and legal portions of the work, be relegated to the last vol., which the student may purchase or not, as he may think fit.

Project of an Instrument for the Identification of Persons, for use in Military Establishments, Police Offices, &c., and for Physiological and Artistic Research. By Joseph Bonomi. London: Longmans, Green, & Co. 1872.

This project is a *curiosa technica*, and we cannot do better than let Mr. Bonomi speak for himself.

"Nature," he says, "in the construction of the human frame, has so ordained, that the measure of the distance from the extremity of one hand to the extremity of the other, when the arms are extended, should be the same as the measure from the top of the head to the sole of the foot." This proportional measure of the human figure, like all the others given by Vitruvius, is to be regarded as the normal proportion which the extended arms should bear to the entire height; for in some individuals the measure of the extended arms exceeds that of the height, while, in others, it falls short, and in others again, it exactly equals the height. From this fact it follows, that every individual of the human family must belong to one or other of three classes: for, either they must belong to that class in which the measure of the extended arms exceeds the height; or, to the class in which the height exceeds the measure of the arms; or thirdly, to that class in which the measure of the extended arms is exactly equal to that of the height.

This law, then, of natural growth, which enables us to divide the human family into three distinct classes, is not only of great physiological interest, but is also of great social importance, because, as it will be shown, it may be made by a very simple apparatus to furnish the means for the identification of any adult person with a certainty that could not be obtained except by a careful scrutiny of the naked body.

With a view to illustrate the application of the instrument for measuring in the clearest and most comprehensive manner, two persons, as remarkable samples of growth, have been chosen and drawn in outline, in what an architect would call "geometrical elevation"—that is to say, without perspective, and to scale, and in a way that permits of comparing by actual measurement one figure with the other. The smaller figure represents a dwarf, 3 feet 3 inches in height; the larger figure a giant, 8 feet in height. Both figures are represented in the position in which the person to be measured by the instrument is required to stand.

The two remarkable samples of growth here quoted are represented naked, in order that the comparison, in a scientific point of view, should be more exact than it could have been had the figures been clothed or represented in perspective. It is not, however, in the least necessary that persons to be measured by the instrument should be at all undressed, allowance being made for the depth of the heels of the boots.

In the space to the right is drawn to scale the indicators for ascertaining the height and extent of the arms. They slide down, and are maintained in the right position by means of the tongue of wood, which exactly fits the groove. The projecting flat part of the indicator, to measure the height, should not be less than five inches in width and nine inches in length. The indicator which is to measure the extent of the arms need not be so long, but it must be of the same width as that for the head.

The main part of the instrument consists of two laths of deal, fixed at certain angles against a wall. Down the centre of each lath is a groove in which slides an indicator. The indicator which is to measure the height is brought down to touch the top of the head, and that which is to measure the extent of the arms is made to touch the extremity of the middle finger of one hand, while the extremity of the middle finger of the other touches an upright strip of wood or an angle of the room in which the instrument is fixed.

Thus, by the simple movement of the indicators, both the height and extent of the arms are almost simultaneously ascertained, the two inclined laths being divided into feet, inches, and eighths of an inch, in order to secure the greatest possible accuracy.

The mode of obtaining the proper inclination of the two laths Mr. Bonomi explains by reference to a diagram, and he afterwards decribes the method of recording the measurement, and adds:—

Statement of the analysis of the measurements of the height and extension of the arms of 84 persons taken with the instrument by the Author.

In the 84 persons, male and female, there were—

54 long armed,
24 short armed, and
6 whose extended arms were exactly
— equal to their height.
84

54, 24, 6, being in the ratio of the squares of 3, 2, and 1.

The greatest excess of length of arms was in the case of a carpenter, whose arms exceeded his height by five inches. The greatest excess of height over the extended arms was four inches, and that was in the case of an architect.

In the 84 persons there were not two in whom the measures of height and extent of arms were alike—that is to say, that though there were six persons of whom the length of the extended arms was the same as the height, yet, of those six, not two were of the same height.

This shilling pamphlet of 12 pages embellished with appropriate illustrations is, after all, highly interesting, and worthy of attention by all our public departments which require to identify persons, and, indeed, by all persons interested in physiological researches.

New Theory of Galvanism:—The Electrothermology of Chemistry, Electricity, and Heat Phases of the same principle. By Thomas Wright Hall, M.D., L.R.C.S.E. Edinburgh,: Edmonston & Douglas, 1872.

This is a very interesting and instructive treatise on an important subject, for as the author appositely observes—

Heat is held the fundamental cause of most of the beautiful, complex, and enigmatical phenomena of chemistry.

Heat is considered to be as closely kin to electricity as is infancy to manhood, and thus to be all-worthy of scientific apotheosis.

Our author goes on to state the *raison d'être* of this treatise thus:—

To one viewing heat in such novel aspects, it is clear that new ideas must have occurred, and, consequently, new words, to express these ideas, became indispensable; and I am indebted to Professor P. G. Tait, of Edinburgh, for his valuable suggestion of the word "thermic," to express certain conditions of heat supposed by me to exist in chemicals. In addition to "thermic," I have been forced to use, throughout this essay, several other new terms. I am aware that these new words may sound uncouth, but their absolute necessity for the intelligible explanation of my views, will, I hope, excuse their employment, and in a measure disarm stringent criticism. I may farther state, as an apology for having published at all these ideas about heat, that no other better way of testing whether these ideas were true or false could be found.

Dr. Hall's treatment of this important subject he thus introduces to the public:—

If powdered antimony be thrown into chlorine gas, the chemical action between these two substances is so strong that the antimony at once takes fire and burns brightly into the terchloride of antimony. But if, according to Schrötter (*Chemie*, vol. i. p. 129), the antimony and the chlorine be both cooled down to minus 106° by a bath of solid carbonic acid and ether, then the chlorine and antimony, thus cooled, refuse to combine chemically, and remain in intimate contact as passively as if they were sand and common air. Again, if antimony be exposed to dry or moist air for any length of time, antimony remains unaffected chemically by the air, and if the self-same antimony be *heated* in the self-same air, the heated antimony at once combines with the air, takes fire, oxidises, burns into the teroxide of antimony.

The simplest of chemical experiments are not the least suggestive, and prove the great fact that heat exerts the following most remarkable influences on chemical action:—

Heat, that is change of temperature, may nullify or prevent chemical action, though that action be of the most violent nature.

Heat, or change of temperature, may intensify chemical action, though of the weakest kind.

That is, simple changes of temperature alone; certain determinate states of heat may destroy or may create, *pro tempore*, chemical action. Now this is surely very suggestive, for if the above simple and artificial states of heat in the bodies prove so potent in chemistry, it at once occurs to the mind to ask, What effect shall the much more perfect natural states of heat, that is heat properties of chemicals, have on their chemical behaviours? and in order to answer that question we proceed to study what I shall venture to call "Thermochemics," that is, the consideration of heat as a specialty in chemistry.

The most prominent heat states or heat properties of chemicals are their conditional heat, their specific heat, their weight heat, and their conduction of heat.

If we examine the condition of chemicals, say for convenience and perspicuity, those of the metals and metalloid oxygen, we find those conditions very varied and very different one from another. One metal, hydrogen, exists as an unliquefied gas, that is a gas far from liquidity, far from *a form change*.

Another metal, mercury, is a liquid.

Another metal, potassium, is a solid, but a solid that is near liquidity—that is, that is easily fused, that is near to a form change.

Another metal, zinc, is a solid, but a solid not so near liquidity, not so fusible, not so near a form change as is potassium.

Lastly, another metal, platinum is a solid, and a solid very far from liquidity, very difficult of fusion, very far from a form change.

Now it seems to me impossible to doubt that heat must have a direct and necessary influence in causing these wide differences in the physical condition or forms of the above mentioned metals. For let us take the two metals hydrogen and platinum, and contrast them thermally.

Hydrogen is an unliquefied gas.

Platinum is a well nigh infusible solid.

Now it seems to me utterly impossible to conceive or suppose that gaseous hydrogen and infusible platinum can have equal heatfulness, can have the self-same amount of heat in their ultimate molecules, for hydrogen is as it were many times more thermic or heatful than the hottest of steams, and platinum many times more athermic or heatless than the coldest of ice. Hydrogen being an exceedingly rarefied gas, it seems presumable that in hydrogen there should exist much more latent heat than in the infusible solid platinum; and if it be so, then hydrogen is what I shall throughout this paper call conditionally more thermic than platinum; and not only that, but for a like analogous reason, the metal mercury shall be more thermic conditionally than the metal potassium. Because mercury, being liquid, is thus nearer the hot gaseous state than is potassium, which happens to be a solid. And for the same reason potassium shall be more thermic conditionally than zinc, inasmuch as potassium is nearer the hotter form of liquidity,—is much more fusible than zinc. And further for the same reason, zinc shall be conditionally more thermic than platinum, for zinc is much more fusible than platinum.

I do not mean to say that the above-mentioned metals are one hotter or colder than another in such a way as to affect our feelings or touch, or even the more trustworthy thermometer; but what I assert is that the said metals are, some latently conditionally thermic, as I shall term it, and others latently conditionally athermic. I must beg it as an axiom if it cannot be granted otherwise, that *any* metal that is a gas is to be considered conditionally more thermic than any given metal that is a liquid; and in further extension of the axiom, *that any given metal that is a liquid* is to be held what I have called conditionally more thermic than any given metal that is solid; and moreover, that any given metal that is solid, and fuses with ease, being thus near liquidity, is more thermic or heatful conditionally than any given metal that is solid, and is far from its fusion, or fuses with less ease.

The physical states or conditions of gaseity, liquefiability, liquidity, solidity, fusibility, in which metals are found in nature, prove thus the indication of their states of conditional heat.

But the second of our great heat properties of metals is their capacity for heat. And surely if heat has to play important parts in chemistry, the capacity for heat in chemicals must be of the greatest importance in chemistry. And so it proves, for the capacity for heat in metals bears a marked proportion to their atomic weights—is the same, with a few exceptions, with these atomic weights. So that an equal heat that will raise 65 grains of zinc 10° in six minutes, will in the same time and conditions raise not 65 grains of platinum, but 197 grains, and 200 grains of mercury, and 39 of potassium, and so on.

So that zinc and potassium have far more power of appropriating heat, of taking quantities of heat and stowing it away in a latent state in their ultimate textures, than platinum has, for 65 grains of zinc and 39 of potassium will swallow up as much heat as 197 grains of platinum. After say six minutes' heating of zinc, potassium, and platinum, there will exist much more concentrated heat, latent in potassium and zinc than in platinum.

We will therefore assume it is an axiom that the less the atomic weight a metal has, the greater its heat capacities; the more thermic or heatful atomically, as I shall term it, the metal generally is.

So that of all the fore-mentioned metals hydrogen is atomically most thermic, because hydrogen's atomic weight is 1, the smallest atomic weight among chemicals. Next to hydrogen in the said metals comes potassium, for potassium's capacity for heat is as 39; after potassium comes zinc, whose capacity for heat is as 65; then platinum, which is as 197; then last of all is mercury, which is as 200, and which is thus the coldest atomed metal in our short list.

So that the capacity for heat of simple bodies, or, what is nearly the same thing, their atomic weights, afford also a most valuable indication of the atomical heat states of simple metals.

But the third great heat properties of metals is what I shall term their weight heat, their mass heat, their grain heat; for just as heat influences a metal's expansion, so heat influences a metal's specific gravity; and just as a metal's expansion has been taken and used as a heat indicator, I propose that a metal's specific gravity be used as a special heat index, as a chemical thermometer; and as the effect of heat is to make metals lighter, I will assume it is axiomatic that the lighter a metal is the hotter grained it is.

Thus, of the already-mentioned metals, hydrogen is the hottest grained, inasmuch as hydrogen is the lightest of them. Next to hydrogen comes potassium, for potassium is certainly heavier than hydrogen, and lighter than all the others of the said metals. After potassium comes zinc, then mercury, and last platinum.

Our fourth great heat property of metals is their conduction of heat, and this must be held also of extreme importance, for it is clear that, whatever be the influence and effects of heat in chemical action, conduction of heat in a chemical must facilitate those heat actions, as non-conduction of heat must impede them.

So that there are, at *least*, three ways in which a metal can be chemically thermic or athermic, heatful or heatless—by *condition*, by *specific heat*, and by *weight*. Some metals, as hydrogen and potassium, are heatful by all these three tests; and these metals are therefore types, or our beau ideals, of chemically thermic metals,—are very thermic, calorous, heatful indeed, very positive or plus as to heat, for they are hot conditioned, hot grained, and hot atomed. Some metals, on the contrary,, such as platinum, are athermic by all these three tests, and are therefore our beau-ideals of chemically athermic or heatless, or non-calorous metals, and are very athermic indeed, very negative or minus as to heat, for they are cold conditioned, cold grained, and cold atomed. Mercury is, however, very thermic conditionally, but so athermic atomed and grained that mercury ranks more as an athermic or heat negative metal than as a thermic one, for mercury is very heavy and has very low specific heat. The heat properties of mercury counterbalance each other, not an unusual occurrence in chemistry.

In the simple experiments with which we began this paper, the changes of temperature to which antimony and chlorine were subjected by Schrotter were wholly artificial. But if we apply our axioms and rules just enumerated, we find that nature has made for us analogous experiments, for nature has cooled down platinum in a bath many times colder than that of the solid carbonic acid and ether, and heated up hydrogen in furnaces far hotter than any made with hands, and with analogous chemical results to those produced by the cooling or heating of puny art. For chemically thermic potassium and thermic hydrogen have most violent chemical activity, and the very chemically athermic platinum is one of the most inactive of chemicals; while irregularly thermic and athermic mercury presents chemical actions corresponding to such unsymmetric heat properties.

The author continues the consideration of heat in regard to metals, whether chemically thermic, thermally irregular metals, with hints of chemical heat on chemical behavour.

In the second chapter Dr. Hall discusses conditional heat changes or discharges during chemical binary combination, heat discharged from or into both combiners, when discharged from one combiner to the other; such conditional heat discharges, like electric discharges, leading to a heat equilibrium, the reverse heat changes during binary decompositions and heat metallicity.

In the next chapter we have heat considered as a great cause of form change in nature turning visible ice into invisible steam; and heat is shown to be the cause of the allotropies of chemicals, and of form change of chemicals, also that chemical compounds are a mixture of allotropies or glowshapes of their ingredients.

(Continued on page 13.)

THE SUGAR MANUFACTURE IN EGYPT.

At a recent meeting of the Institution of Civil Engineers a paper was read "On the Aba-el-Wakf Sugar Factory in Upper Egypt," by Mr. W. Anderson, M. Inst. C.E. A narrative was first given of the manner in which Mr. J. Easton, M. Inst. C.E., had been invited by H. H. the Khedive to report on his sugar estates, and the consequent ordering of the factory that formed the subject of this communication. The position of Aba was described as 120 miles south of Cairo and about two miles west of the Nile. A general sketch followed of the ordinary methods of converting cane-juice into sugar, clarified by lime only, or with the bi-sulphite of lime also, concentrating in the rudest manner in open pans and concretors, or, as at Bene Mazar, a neighbouring factory erected by Messrs. Eastons and Anderson, in the more perfect double and treble action tubular concentrators working in vacuo, with filtration of juice and syrup through animal charcoal, granulating at the atmospheric pressure, or in vacuo, and curing by centrifugal machines.

The immediate subject of the paper was divided into three parts. 1. A general description of the process of manufacture. 2. A detailed description of some of the machinery designed expressly for the new process. 3. An investigation of the chemistry and physics of the manufacture. It was mentioned that Mr. G. Ogston, analytical chemist, had carried out all the necessary chemical investigations before the new process was adopted, and had subsequently visited Aba and determined the percentages of various sugars produced.

Under the first head, it was explained how the juice delivered from the cane mills was raised by a centrifugal pump into the steam clarifiers, was then caused to boil, treated with sulphurous acid gas, neutralised by milk of lime, run down into subsiders, decanted when clear, and passed through steam concentrators, from which the syrup flowed into tanks, whence it was sucked up into the vacuum pans, boiled to grain and let down into waggons. The sugar was next emptied into coolers, was thence passed through mixing mills, and was finally cured in centrifugal machines. The scum from the clarification was placed in hydraulic presses to separate the juice carried away by it. The steam generated from the juice was collected under 3 lbs. to 6 lbs. pressure, and was used to boil the vacuum pans, and to work the steam engines driving the vacuum and water pumps, centrifugal machines, and mechanics' shop.

Under the second head, the four cane mills were minutely described. They were of the three-roller class, with rolls 48 inches in diameter, 5 feet 6 inches long, and driven in a manner totally different from anything hitherto attempted. The main features of the new system of gearing were that the mill pinions were nearly double the diameter of the rolls, that the power was distributed through a larger number of pinions so as to permit a greatly increased width of bearing face on the teeth, and that alterations in the set of the rolls did not affect the working of the wheels. The cane mills were actuated by double cylinder condensing, or Wolff beam engines, with reversing motions, and supplied with steam by four Cornish multitubular boilers. Indicator diagrams taken off the engines, and the known evaporative powers of the boilers, were shown to agree in assigning 68 indicated horse power to each set of crushing machinery.

The raw juice tank with its double set of strainers, the centrifugal juice pumps and engines, and the sulphurous acid producing apparatus and pumps, were next described. The twelve clarifiers with copper bottoms and steam jackets held 450 gallons each, and were heated by steam at a pressure of 60 lbs. Experiments had been made on them, and they were found to transmit, per difference of 1° of temperature per square foot of heating surface per hour, 260 and 219 units of heat in warming water and juice respectively, and 606 and 521 units in evaporating.

The subsiders, twelve in number, were plain cast-iron tanks of the same capacity as the clarifiers. They are fitted with sliding Appold overflows for decanting, and with scum and wash-out valves. The scum and subsidence were collected in two tanks, from which, by means of hose, they were run into bags placed in two hydraulic presses. These had inverted cylinders, were double acting, and were worked by the ordinary water supply of the factory, giving a total pressure of 2¼ tons, which was found to be sufficient to separate the juice from the solid scum.

The clarified juice at about 160° temperature was concentrated in five trays of novel construction. The lower part of each tray consisted of a steam boiler, 23 feet by 6 feet by 12½ inches deep, from the bottom of which hung 467 water pipes with internal circulating tubes, the whole set over a suitable furnace. The upper plate of the boiler formed a copper tray 6 inches deep, the surface augmented by 495 brass nozzles, and covered in by a semi-circular sheet-iron dome for the purpose of collecting the steam generated from the juice, which in flowing over the tray lost 57 per cent. of its volume, and was concentrated from 10° to 21° Beaumé. Experiments made with one of the trays at the Erith Ironworks were found to give 271 units of heat in warming and 491 units in evaporating water per difference of 1° per square foot of surface per hour, and a capacity of evaporation equal to 148 H. P.

The four boilers supplying high-pressure steam to the clarifiers and centrifugal machines were of 50 H. P. each, and were externally fired for the convenience of burning megass. They were fed chiefly by the condensed steam from the clarifiers, and could be supplemented by the cane mill boilers when required, by means of a connecting steam pipe.

The five vacuum pans were each 10 feet in diameter and 9 feet 6 inches high, of 370 cubic feet capacity, and were worked by the steam generated from the juice in the concentrators. The vacuum pumps, four in number, were each 28 inches in diameter with a length of stroke of 1 foot 10½ inches, and were arranged under the beams of a pair of condensing engines having cylinders 28 inches in diameter with a length of stroke of 5 feet; they were supplied with steam at a pressure of 3 lbs., also from the concentrators. A similar pair of engines, supplied with steam from the same source, drove the main lay shaft which actuated the mechanics' shop and the centrifugal curing machines. These engines had indicated 28 and 80 horse power respectively. The coolers and crystallizers were all of cast-iron with external flanges. The centrifugal machines had baskets, 30 inches by 11 inches, and were driven under the floor of the curing-house, in groups of six, from countershafts actuated by the main lay shaft, each machine being put in motion, or stopped, by hand gear attached to its casing.

The buildings of the factory consisted of a wrought-iron skeleton, composed of girder-shaped columns, placed 20 feet apart, and connected by arched roof rafters, on which were laid iron purlins and corrugated galvanised roofing. The intervals between the pillars were filled in with 12-inch brickwork, into which iron windows and doors were introduced as required. Travelling cranes on overhead rails ran over the cane mills and vacuum engines. The dimensions over all were 481 feet 6 inches by 155 feet, and 38 feet high, with a total area of 45,162 square feet.

The water supply was derived from the Ibrahimia Canal; the engines and vacuum pans drawing their own injection, while the high service was supplied by double acting pumps on the centrifugals' engines, which raised the water into a tank, having a capacity of 14,000 gallons, placed on the top of a water tower 42 feet high. The factory was lighted by gas produced in a small gas works of 250 lights near the mill.

Under the third head the property of sulphurous acid gas in bleaching and arresting fermentation was alluded to. Its use for sugar making had been patented as early as 1838, and many times afterwards, but although very economical as regards cost, it had met with little favour, the reasons for which were given. The success of the Aba Factory was traced to the circumstance that it was the first constructed expressly for the use of sulphurous acid combined with extremely rapid concentration. The quantity of sulphur and lime used, the latter as compared with the neighbouring factory of Bene Mazar, was then examined, and a comparison of the new and old, but hitherto most perfect system of manufacture, showed that the raw juice was converted into syrup in 2 hours at Aba, against 6 hours at Bene Mazar.

Mr. Ogston's experiments to ascertain the yield of sugar were then described, and the results contrasted with those of factories in Demerara in New South Wales, showing that under the new system there was a much larger return of first white sugars, and a much smaller yield of molasses than in other methods of manufacture.

Interesting investigations were then made as to the degree of concentration necessary in the evaporators to supply steam enough to boil the vacuum pans and to furnish the power required for curing. It was shown that by evaporating 57 per cent. of the juice the desired results should be, and actually had been, obtained. The total power necessary to work the mill was then computed, and, taking into account the work done by the steam from the juice, it was shown that there remained 20 lbs. of dry megass available for the evaporation of every cubic foot of water. The efficiency of megass was shown to be about one-half that of coal, and it was argued that by the new system the manufacture might be carried on without the aid of coal at all. The cost of the mill was then dwelt upon, and contrasted with that of Bene Mazar, showing that there was a saving in capital outlay of 23 per cent. on machinery, and about 11 per cent. for stock of animal charcoal, besides the heavy annual charge for revivifying the latter and supplying the loss by waste. In conclusion it was claimed that on the score of high yield of first sugars, small percentage of molasses, economy of fuel, simplicity of manufacture, and lowness of first cost of machinery, the new process of sugar making promised to become a substantial success.

Acknowledgments were made for the gracious manner in which his highness the Khedive had given permission for the preparation of the paper, for the assistance rendered by Mr. H. D. Anderson, Assoc. Inst. C.E., Engineer-in-Chief of the Paper Mill in Cairo, and the Sugar Factories of Aba Bene Mazar, and Malatea, and for the services of the Resident Engineer of Aba-el-Wakf, Mr. Cheesman, Stud. Inst. C.E., under whom it had been erected and put to work.

NEW PATENT LAW IN JAPAN.

(*Communicated by Her Majesty's Secretary of State for Foreign Affairs, May* 25, 1871.)

HENCEFORWARD exclusive permission to trade in newly-invented articles of all kinds whatsoever will be granted to the inventors.

Patents shall be granted for a term of years to all persons who increase the conveniences of life, who newly invent any chemical apparatus, machinery, utensils, or furniture, weapons, woven fabrics, et cetera, or who improve existing furniture or utensils.

The term of years shall be fifteen years, ten years, or seven years, according to the value of the invention.

Any person desirous of obtaining a patent shall send in his application to the local authorities of the district in which he resides, accompanied by a description, drawings, &c., which shall be forwarded to the Home Office, and the Home Office shall issue the patent.

The objects of the invention or the improvement shall be carefully drawn in cross-section and plan, and in the case of machinery the parts must be numbered or lettered in accordance with the description, so that everything may be clearly comprehensible at a single glance; and the seals of the inventor and of his surety must be attached to the drawings. Models may be furnished of articles of which drawings cannot easily be made.

When the document containing the patent is issued by the Home Office the local authorities shall deliver it, after having obtained a receipt from the inventor and his surety.

A duty of five rio (£1 1s. 3d.) shall be paid annually in advance during the period for which the patent is granted into the hands of the local authorities.

The duty may be increased or diminished, according to the nature of the invention. The amount shall be forwarded to the Home Department as soon as it is collected.

No duty shall be paid until six months have elapsed from the granting of the patent, that period being allowed for the inventor to try whether the sale be remunerative, and when he has ascertained that it is remunerative he will pay in one year's duty to the local authorities.

If from the trial made during the first six months the sale turns out to be unremunerative, the application may be withdrawn at the option of the patentee; but in case such application be made after the expiration of the six months, the duty for one year already paid in advance will not be returned.

The application sent into the Home Office will receive consideration according to priority of arrival.

Where the invention of another has simply been improved, the application must distinctly state the name of the original inventor and the nature of the improvement. Where the invention in respect of which an application is made resembles a prior invention by another individual, but actually differs in construction or use, the points of difference must be clearly laid down in the application.

No patent will be granted for articles of general convenience, though the inventor be known beyond the possibility of mistake, and be yet alive, if the invention has been in general use for several years previous to the application.

Separate patents will not be given to each individual who may have combined with others to produce an invention, but a single patent will be issued in the name of all the partners of the company.

The owner of a patent may freely dispose of it for such sum as seems fit, during the period for which it has been granted; and both parties shall make application to have the fact endorsed upon the patent.

The patentee is at liberty to establish branch shops in his own name, or to teach others how to make the articles patented by him.

Should the patentee die before the patent expires, he may leave the patent to a relation, but application must be made to have the transfer endorsed thereon.

Extensions may be granted in meritorious cases.

Each separate article must bear the words "by Government sanction," together with the name of the inventor.

Fines will be imposed on persons who fraudently make use of a patentee's name, or who, not being in the enjoyment of a patent, make use of the term "by Government sanction."—*From the Journal of Her Majesty's Commissioners of Patents.*

BALL LIGHTNING.

A CORRESPONDENT (says the *Scientific American*) was surprised at the letter of J. H. P., published in a recent number, and states that in 1859 in the Shetucket valley, Conn., he had a view of a stroke of this kind of lightning at about eight rods distance. It struck a tree, rent it from top to bottom, passed off to a cart tongue lying near, into and through a pile of railroad ties, and into the railroad track about two rods distance. It was seen by six other persons, and the size, as it appeared to all, seemed to be as large as a bushel basket. They were in a building on a rise of ground facing the tree, and had a most perfect view of it. Undoutedly there are a good many in the United States who have seen such strokes, if they would take the trouble to answer.

THE SUN AND THE ORIGIN OF STORMS.

MR. JOHN HEPBURN says, "I have seen that all gusts coming up in the morning come from eastward, all about noon from the southward, and all after sunset from the westward; thus clearly proving, to my mind, that the rays of the sun drive the storm, as it were, away from him after their electricity has fired and lit it up. Let the interested please observe and they will find it so, I believe, in all cases."

A SIMPLE HYGROMETER.

A NEW hygrometer has been invented by M. G. Smiths, of Paris, in which a salt of cobalt is the essential ingredient. A solution is made of the salt of cobalt, common salt, and gum arabic; into this strips of paper are dipped, and allowed to dry. They will take on a blue colour in a dry atmosphere, and become rose-coloured if the atmosphere be humid.

CONCENTRATING SULPHURIC ACID TO 66° BAUME.

M. DE HEUIPTUME proposes to use a lead-lined vacuum pan for this purpose. The lead is not sensibly attacked by the acid unless the temperature is 200° or over, while in air the sulphuric acid will not boil except at 325°; in the partial vacuum of the pan, 3 to 4 centimetres of mercury, it will readily boil at 190°. The lead, however, softens at this temperature, and is subjected to a considerable pressure from without; and to avoid this difficulty it is proposed to place in the pan sandstone balls, &c., which are not attacked by the acid.

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THE INVENTORS' INSTITUTE,

4, ST. MARTIN'S PLACE, TRAFALGAR SQUARE, LONDON.

ESTABLISHED 1ST MAY, 1862.

Past Presidents:

SIR DAVID BREWSTER, K.H., LL.D., F.R.S., &c., from the establishment of the INVENTORS' INSTITUTE, till his decease, February, 1868.

LORD RICHARD GROSVENOR, M.P.

Chairman of the Council:

SIR ANTONIO BRADY.

NOTICES.

THURSDAY, JANUARY 16TH, at Eight o'clock p.m., Adjourned Meeting on Patent Law Reform.

THURSDAY, JANUARY 30TH, at Eight o'clock p.m., a Paper will be read on "An Invention for preventing pipes or vessels bursting by the effects of frost." By J. A. CALANTARIENTS, Esq.

Members whose subscriptions are now due will please to forward the same to the Collector, Mr. G. A. Stretton, 4, St. Martin's Place, Trafalgar Square, London.

Monthly Notices.

Tribunals of Commerce.—Death of Mrs. Somerville.—Salaries of Scientific Men in the Public Service.—Patent Law for Japan.—Mr. J. M. Joannides' new Invention for Ventilating and Drying Cotton Bales.

THE subject of Tribunals of Commerce is again before the public, a busybody clique in the Common Council of the City of London having, it appears, determined to promote a Bill for establishing such an institution in the City; but, as might be expected from the acting of such a mere local sectional body, the proposed Bill is not intended to effect the establishment of a tribunal composed of commercial men and industrials as its adjudicators, but is to be a brand-new law-court, with a lawyer, judge, and a few old fogies as commercial assessors, duly assisted by barristers and solicitors. In fact, it is a new scheme for creating places for lawyers, and further complicating our legal system. As we want to see a *bona fide* tribunal for dealing out real justice, and not for administering mere law, and which shall be applicable to the case of inventors and patentees, and competent to deal with questions of trade-mark and copyright, we feel annoyed that such a *travestie* should be attempted to be palmed off upon the public. How is it that the Lord Mayor, who is well known to commerce and manufactures, and is the head of all the Guilds, whose members are many of them men of eminence in commerce and manufactures, cannot assemble them together and get something like a worthy scheme propounded for public consideration? And what has become of our friend J. R. TAYLOR, who was moving in this matter not long ago?

Mrs. Somerville died recently at Naples, at the advanced age of nearly ninety-two years. She was a contemporary of Sir David Brewster—indeed, we believe that in childhood he was her playmate. Her works and merits are so widely known in the world of science that it is unnecessary for us to recapitulate them.

The trumpery salaries of scientific men occupied in our public service are a standing disgrace to this country, and we cannot refrain from quoting from the *Athenæum* the following pertinent remarks, signed "F. R. S.," referring to this matter, for they are thoroughly in accord with the views we have often expressed. In the communication referred to, "F. R. S." says:—

> "The Civil Service Commissioners are advertising for a clerk for the Curator of the Gardens, and a second assistant in the Herbarium of Kew Gardens, to be selected by open competition. The former must be 'familiar with gardening and gardening accounts.' The second is to 'show from previous training that he possesses sufficient skill in the dealing with Herbarium specimens, in the use of the microscope, and in discriminating between species and varieties of plants.' The gardener's clerk, who is only required to have qualifications common to many English and most Scotch gardeners, is to have a salary of £100 a-year, rising to £200. The young scientific botantist, who is expected to be skilful in one of the most abstruse subjects of botanical science, viz., the 'discrimination between species and varieties of plants,' a subject upon which the most experienced and the most scientific botanists do not agree, is to have a salary of £60, rising to £100! The wording of the qualifications required is scarcely such as ought to be put forth by the Civil Service Commissioners, as the decision as to the qualifications and judgment of the candidate would depend upon which of the two sections of botanists the examiner belongs to, whether he is what is known in technical language as a 'lumper' or a 'splitter'; for the reply that one would consider good, and accept, the other would consider bad, and reject. Thus, for example, if Mr. Bentham and Mr. Miers, gentlemen who have studied and written on the species of plants for more than a third of a century, were asked to define the discrimination between species and varieties of plants, their replies would be as far as the poles asunder."

The Japanese have lately given practical proof that they are no disciples of Mr. Macfie and our saintly Lord Chancellor, for they have promulgated a Patent Law, an abridgment of which will be found in another column.

Our friend Mr. J. M. Joannides, whose invention for ventilating and drying corn in ships, granaries, &c., was noticed in our pages not long ago, has called our attention to a somewhat similar invention of his for the ventilation of cochineal boxes, which is also applicable to the ventilation of cotton bales. It has been most successfully adopted in cochineal boxes, and recent experiments promise well for it in regard to cotton bales. We shall hereafter refer to this matter, and supply our readers with full details; if, in the meantime, they would like to know more about the matter, they can apply to Messrs. Adutt, Finzi, & Co., 24, Mark Lane, London, E.C.

The Inventors' Institute.

At the first Members' Meeting of the Session 1872-73, held on Thursday, the 21st November, 1872, in consequence of the unavoidable absence of the Chairman of the Council, Sir Antonio Brady, the chair was taken by Mr. F. W. Campin, Barrister-at-Law, member of the Council of the Institute, who stated that he must solicit the indulgence of the meeting, as he had had but little time for preparing himself for his task. He then said:—It has been the custom in this, as in other kindred associations, that upon commencing a new session the work that had been accomplished in the last session should be passed in review, and the business for the opening session laid before its members. With regard to the last session, he thought everyone connected with the Institute would feel that it had been on the whole a great success. As they were most of them aware, the acceptance of Sir Antonio Brady of the Chairmanship of Council was deemed a fitting occasion for inaugurating the last session by a public dinner, which took place at St. James's Hall on 30th November 1871, the proceedings at which (duly reported in the Scientific Review), as also at the opening meeting, held the same day at the usual meeting-place of the Institute, 4 St. Martin's Lane, Trafalgar Square, were of the most pleasant and satisfactory character, so much so, indeed, that it has been urged by some members of the Institute that such friendly gatherings should be oftener indulged in by its members. But the Institute, although it has given attention to these amenities of life, has not the less been attentive to its more serious duties, the first matter it undertook to deal with being the very important one of technical education, a subject that he (the Chairman) had more than once brought under the notice of the members, especially in regard to its connection with the Civic Guilds. In the movement in this matter the Council were fortunate enough to obtain the co-operation of Mr. John Scott Russell, and under his presidency were held several meetings of delegates from the Technical University, Artisans' Associations, and other bodies, which eventuated in the adoption of resolutions detailed in the Scientific Review for January and May, 1872. However, in deference to the views of some of its leading members, the Council determined to refer all further proceedings on technical education to the committee that had been formed, and to leave it to act as a distinct body, under the presidency of Sir Antonio Brady, which was accordingly done, and the proceedings of that committee will be found reported in the Scientific Review for January and February of the present year, which also contains a report of the reading of a paper by Dr. Mill, of the Technical University. The next subject that engaged the attention of the Institute was one introduced to the notice of its members by a paper (*vide* Scientific Review) read by Mr. B. Fletcher, M.I.B.A., "On Inventions and Patents connected with Building," which led to a very animated discussion, which was adjourned to a second night, and received a large share of attention from the general public, as evidenced by the favourable reports given by the public press. "The Purchase of Railways by the State," by Mr. Raphael Brandon, F.R.I.B.A., was another important matter introduced to the notice of our members by a paper read at one of our fortnightly meetings. The important subject of preserving corn, grain, and other substances from mildew in ships, granaries, and stores, by means of a ventilating apparatus invented by Mr. J. M. Joannides, formed the subject of an able paper read by Mr. L. M. Adutt, which led to an interesting discussion demonstrating the invention to be one of considerable promise of practical value. Mr. J. H. Varley's paper on inventions relating to telegraphy also deserves special mention, for it was a masterly dissertation on the principal means adopted in telegraphy, comprising some suggestions as to important improvements. At some of the meetings of the Institute a lamp burning a new composite oil or liquid, which gave a clear, brilliant light, equal to seventeen sperm candles, was exhibited by Mr. C. C. Molchin, which was produced at a cost somewhat greater than paraffin, and satisfied all present that a valuable addition had been made to our lighting *media*. The Patent Laws have also formed the subject of consideration and discussion at several meetings of the Institute, and complaints as to their many defects have been as numerous and emphatic as ever. The Council, however, has not been content to allow Patent Law Reform to be treated simply as a matter to be talked over, but have taken such measures as were available to them for bringing out some practical results from the long and earnest labours of the Institute in this, the foremost of the objects of its programme. Our members will remember that in 1871 Mr. Bernard Samuelson, M.P., Mr. Mundella, M.P., and Mr. Hinde Palmer, M.P., pressed for and obtained the appointment by the House of Commons of a Select Committee of Inquiry into the subject of the law and practice of Letters Patent for Inventions, which sat till nearly the end of the session of 1871, and issued a first report in the autumn of that year, the proceedings of which committee were deemed to be anything but satisfactory, and have been much criticised in the pages of the Scientific Review. This committee was re-appointed at the commencement of the session 1872; the names of myself and other members of the Institute were suggested to the committee as competent witnesses on its behalf, and before that committee closed its evidence they did examine me, but refused, on the ground of want of time, to allow me to speak sufficiently at large to enable our case to be properly developed. The Council of the Institute, therefore, came to the conclusion that a movement should be made to obtain a fuller and more impartial inquiry into the whole question of the Patent Laws by means of a Royal Commission, to be composed principally of eminent inventors and patentees, but the session was too far gone to effect anything in the matter; therefore this remains as business now in hand.

Mr. Campin added:—Gentlemen, I have thus reviewed our past proceedings, and therefore will now speak of our future policy by saying that the Council will continue to fight for Patent Law Reform of the most complete kind, and moreover will spare no pains to render the proceedings of the Institute as pleasant and profitable to all as they possibly can be made.

After some general remarks by members present at the meeting,

Mr. Thomas Blanchett proposed a vote of thanks to the Chairman, and in doing so took the opportunity of stating that he considered the present state of the law of patents as highly oppressive. He himself had invented an apparatus for exhibiting withinside railway and other passenger carriages the name of the station at which it was stopping or about to stop at, and he found that the expense and loss of time involved in bringing this invention into practical form was very considerable, and he knew that his position in this respect was by no means peculiar to himself, nor was the fact that this expense, when added to the somewhat considerable charges for the patent, were to men of small pecuniary means almost sufficient to break them down altogether. Moreover, the difficulty and expense of patent law suits were, as a matter within his own business knowledge, most outrageous.

Mr. Regan, in seconding this motion, mentioned that he considered the Institute would do well to make an effort to get inventors placed on a better footing when dealing with the Government. He was now treating with the Government department for the introduction of his furnace improvements into the public service, and he found that after the heads of the department had decided in his favour, he had afterwards to be subject to vexatious opposition from underlings in that department.

Mr. Latham explained that the Council were only too happy to receive any hints or suggestions for improving the Patent Laws, and he could assure the gentlemen who had spoken that the Council would do all they could to remedy the evils they had referred to.

The vote of thanks having been put, was carried unanimously, and the Chairman having briefly returned thanks, the meeting closed.

On Thursday, 5th December, the paper read was on "Trade Guilds as promoters of Invention and Technical Education." At this meeting the chair was taken by Mr. Faulding, Member of Council, and Messrs. Campin, Carlton, and Morgan took part in the proceedings. The report of this meeting, as also of the meeting on 19th December, is reserved till next month.

Proceedings of Societies.

INSTITUTION OF CIVIL ENGINEERS

At the meeting on 26th November, Mr. Hawksley, president, in the chair, the paper was "On the Aba-el-Wakf Sugar Factory in Upper Egypt," by Mr. W. Anderson, M. Inst. C.E. This paper will be found in another column.

At the meeting of this society on Tuesday, the 3rd December, Mr. Hawksley, president, in the chair, the first ballot for the session 1872-73 was taken, when forty-seven candidates were balloted for and declared to be duly elected, including five members—viz., Messrs. Robert Edward Forrest, ex. eng., P.W.D., Government of India; Mr. William Hall, ex. eng., P.W.D., Government of India; Mr. John Skardon Heyman, ex. eng., P.W.D., Government of India; Mr. Robert Morton, chief engineer to the London Gas Company; and Mr. Henry Robert Waring, La Peubla, Majorca. Forty-two gentlemen were elected associates—viz., Mr. Samuel Abbott, assistant engineer, Great Northern Railway; Mr. John Addy, Stud. Inst. C.E., resident engineer, Hornsey Drainage Works; Mr. John Aiton, Iron Works, Holytown, Glasgow; Mr. John Romilly Allen, late assistant engineer at the Liverpool Docks; Mr. Crawford Peter Barlow, B.A., Stud. Inst. C.E., Westminster; Mr. William Adamson Barron, Westminster; Mr. George John Burke, assistant engineer, P.W.D. Government of India; Mr. John Montriou Campion, Stud. Inst. C.E., assistant engineer, Punjaub Northern (State) Railway; Mr. William Henry Clemmey, borough surveyor of Bootle; Mr. William Griffin Davis, Brabant Court; Mr. George Frederick Deacon, borough and water engineer of Liverpool; Mr. Francis Henry Evans, Queen's Gate; Mr. Richard Thomas Hall, Port Nolloth, Cape of Good Hope; Mr. Edward Westley Jacob, Hamilton's Windsor Bridge Iron Works, Liverpool; Mr. Ailsa Janson, Gyéres, Hungary; Mr. Frederick John Johnstone, ex. eng., P.W.D., Government of India; Mr. William Benjamin Leggatt, ex. eng., P.W.D., Madras; Mr. Evan Leigh, Manchester; Mr. Alfred David Lewis, East Greenwich; Major John Frederick Adolphus McNair, late R.A., colonial engineer of the Straits Settlements; Mr. Edward John Theodore Manby, Pisagua, Peru; Mr. Thomas Thomas Marks, town surveyor, Lowestoft; Captain James Law Lushington Morant, R.E., ex. eng., P.W.D., Government of India; Lieutenant William Gustavus Nicholson, R.E., Calcutta; Mr. Wellesley Innes Noad, Stud. Inst. C.E., Westminster; Mr. Francis William Otter, Westminster; Mr. Alexander Payne, Westminster; Mr. William Pelham Richardson, ex. eng., P.W.D., Government of India;

Mr. James Robertson, Iron Works, Holytown, Glasgow; Mr. Alexander Manson Rymer-Jones, late resident engineer on the Mexican Railway; Mr. Charles Edward Shepbeard, Ealing; Mr. Rupert Tuberville Smith, assistant engineer, P.W.D., Government of India; Mr. Arthur Southam, surveyor to the Wandsworth District Board of Works; Mr. Thomas Samuel Speck, resident engineer and locomotive superintendent of the Metropolitan District Railway; Mr. John Alfred Stockwell, East Greenwich; Mr. Henry Tivy Tomkins, chief surveyor to the parish of St. George's, Hanover Square; Mr. Frederick Robert Upcott, assistant engineer, Indus Valley (State) Railway, India; Mr. Griffin William Vice, assistant engineer, P.W.D., Government of India; Mr. James Henry Waller, Stud. Inst. C.E., Allenstown; Mr. Edward Bentinck Williams, Dock Office, Hull; Mr. Corbet Woodall, chief engineer of the Phœnix Gas Company; and Mr. Henry Robert Woolbert, Westminster.

The Council reported that, acting under the provisions of the bye-laws, they had, since the last announcement, transferred Messrs. John Howkins, jun., and Francis William Webb from the class of associate to that of member, and admitted the following candidates students of the institution—viz., Messrs. Thomas Blair, George Dundas Churchward, Arthur Osbert Cooper, Matthew Curry, jun., Thomas Elmitt Curry, Percy Rigden Dix, Bernard William Flatt, Gustave Adolphe Haas, Frederick James Leigh, Boswell Parkinson Milsom, George Phillips Mulock, Charles Edward Pickford, John Wallis Shores, John Smith, Richard John Symonds, and Herbert Charles Erskine Vernon.

ROYAL NATIONAL LIFEBOAT INSTITUTION.

At the last meeting of this institution at its house, John Street, Adelphi, London, Thomas Chapman, Esq., F.R.S., V.P., in the chair, the minutes of the previous meeting having been read by the secretary, Richard Lewis, Esq., rewards to the amount of £583 were granted to the crews of lifeboats of the society for services rendered during the past month. The Whitburn Lifeboat, during a dark and tempestuous night, put off to the stranded barque *Canada Belle*, of Whitby, and after a long absence she returned in safety with two women, two children, and four of the vessel's crew. These persons had been taken into the lifeboat when a heavy sea broke on board, which filled the boat, parted the rope which held her to the wreck, and drove her away. A gallant but unsuccessful attempt was then made to regain the ship, during which time several of the oars were broken. The boat then returned for additional oars beyond the spare ones on board, and, having landed the women and children, they took in four additional men to assist, and proceeded again to the wreck, and, after being driven back four times, they eventually succeeded in getting the remainder of the crew off, and brought them safely on shore, making fifteen persons in all the lifeboat was fortunately enabled to save from this wreck, to the great joy of the crowds of spectators on the beach. The Fishguard Lifeboat, *Sir Edward Perrott*, was also out on two occasions in a strong gale, and was enabled to rescue the crews, numbering altogether eleven men, from the smacks *John and Grace*, of Milford, *Mary*, of Cardigan, and *Commerce*, *Lion*, and *Ellen Owen*, of Cardigan, The Odd Fellows' Lifeboat, at Cleethorpes, was the means of saving the crew of two men from the sloop *Queen Victoria*, of Lynn, which had gone on the Grainthorpe Sands. The Scarborough (Warwickshire Freemasons') Lifeboat had rescued altogether twenty men from the brig *Palestine*, of Whitby, the brig *E. J. D.*, of Nantes, and a boat from the steamer *Allemania*, of Hamburgh. The Lowestoft (No. 1) Lifeboat had gone off to the brig *Expedite*, of Drobak, which was on the Holm Sand in a dismasted state; on nearing her the anchor was let go and the boat veered down to the wreck. The Greencastle (Londonderry) Lifeboat, after two attempts, brought ashore the master and one of the crew from the barque *L. G. Biglow*, of Yarmouth, N.S. On this occasion two of the lifeboat men received some injuries through the surging of the tow-rope, the lifeboat at the time being in tow of a steamer. The Abersoch Lifeboat had gone out in the night in a furious gale, which at times had the force of a hurricane, and was fortunately successful in saving the crew of four men from the schooner *Maria*, of Aberystwyth. The Ramsgate, North Sunderland, New Brighton, and Caister (No. 2) Lifeboats had materially assisted to save the distressed brig *Marguerite*, of Cherbourg, schooner *Don*, of Jersey, barque *Vale of Neath*, of Liverpool, and schooner *Miditieur*, of Nantes, and their crews of forty-one men. The Swansea Lifeboat had saved from the stranded barque *Paladin*, of Genoa, the crew of twelve men and two pilots. The Tenby Lifeboat had remained alongside the schooner *Aden*, of Liverpool, until she was got to a place of safety. The Port Isaac Lifeboat had brought the fishing luggers *Castle* and *J. T. K.*, of that place, and their crews of eight men, safely to shore, they being in great danger from a heavy ground swell which had suddenly sprung up. The Plymouth (*Prince Consort*), Newcastle (*Dundrum*), and Lyme Regis Lifeboats had saved nine persons from the brigantine *Laurel*, of London; eight men from the barque *Juliana*, of Riga; and fourteen men from the barque *Cassibelaunus*, of North Shields. Altogether the lifeboats of the institution were instrumental during the past month in saving 165 lives from different wrecks, besides rescuing seven vessels from destruction. The silver medal of the institution, a copy of the vote inscribed on vellum, and £5 each, were presented to Mr. Charles Blampied, farmer, Mr. Elias Whitley, farmer, and John Bouchard, labourer, of St. Martin's, Jersey, in acknowledgment of their gallant and determined services in putting off twice in a small boat during a heavy gale from the westward, and proceeding a long distance to the ship *Isabella Northcote*, of Christiana, which had gone on the Ecretio Rocks off the Jersey coast. The three brave men were enabled in the two trips, under the most perilous circumstances, to save the whole of the crew, eighteen in number. The shipwrecked men were landed on a rock, where they were carefully tended in a hut by a poor man named Charles Pince and his wife, who were most generous and hospitable to them. A reward of £5 was voted by the institution to the old couple for those kind services. Other rewards were also granted to the crews of shore-boats for saving life from wrecks on our coasts. In addition to the foregoing rewards, payments amounting to £2250 were ordered to be made on different lifeboat establishments. Several contributions to the society were announced, including £100 from the Dowager Marchioness of Westminster, £50 from W. Gore Langton, Esq., M.P., and £36 17s. 4d. the result of an additional entertainment by the Newport Histrionic Club in aid of the funds of the institution. The late Mr. John Douglas, comedian, of Boston, Lincolnshire, had left the society the whole of his estate after the death of his wife. A report having been read from Captain D. Robertson, R.N., the assistant-inspector of lifeboats to the institution, on his visits to the coast during the past month, the proceedings terminated.

THE VICTORIA (PHILOSOPHICAL) INSTITUTE.

The first meeting of the new session was held at the rooms, Adelphi Terrace, on December 2nd. The attendance was very large. The honorary secretary having announced the election of sixty-two new members since the last meeting, and a large number of additions to the library, Mr. Charles Brooke, F.R.S., vice-president, proceeded to read a paper on "Force and Energy." He held that the principle of the conservation of energy had been misapplied by some writers to the promotion of views that lead directly to materialism, pantheism, or atheism; whilst others, who rightly hold it to be one of their first and highest duties to oppose such views and to counteract their tendency, appear to have held it necessary to impugn the principle altogether, instead of assigning a limit to the scope of its legitimate application. He then proceeded to quote the views held by those who had taken up the question, amongst them being Mr. Justice Grove, Professors Balfour Stewart Ball, Dr. Joule, Dr. Tyndall, Herbert Spencer, Baring-Gould, and many others; and, amongst other important matters, gave the result of the investigations on light and heat made by various men of science at home and abroad. Mr. Brooke defined force as a mutual action between different portions or particles of matter, by which they were either attracted or repelled from each other; and the conservation of energy implied that no kind of energy could be produced by human agency, except at the expense of an equal amount of the same kind, or an equivalent amount of some other kind of energy. From this it followed that, so far as physical law was concerned, the total amount of energy in the universe must remain unchanged. But to assert that it was, under all circumstances, unchangeable was a very different matter. The creation of matter must necessarily imply the creation of energy, and those who denied the possibility of the one must that of the other; they must, in fact, deny the existence of Omnipotence. It was much to be regretted that the principle of the conservation of energy had by some been misapplied to questions far beyond its legitimate scope in a fruitless effort to supersede the necessity of an omniscient Creator. In the opinion of the writer, the indisputable establishment of this principle conveyed only a more exalted idea of that infinite wisdom by which the perpetually-recurring transformations and interchanges, not only of the materials, but also of the powers of nature, were rendered subservient to the predetermined laws which governed the comfort and welfare of all created beings. Papers were read from Dr. M'Cann, and by the Rev. Mr. Moore, both of whom were alluded to in Mr. Brooke's essay. A long discussion followed the reading of the paper, after which it was announced that the second meeting, at which new members will be elected, would take place on the first Monday in January, when Dr. C. R. Bree would read a paper "On Darwinism and its Effects upon Religious Thought."

SOCIETY OF BIBLICAL ARCHÆOLOGY.

At the meeting on Tuesday, December 3, 1872, Sir Henry Rawlinson, C.C.B., D.C.L., in the chair, the following gentlemen were duly elected members of the society:—Sir William Tite, C.B., M.P., F.R.S.; M. Le Baron de Cosson; and Mr. H. Morris, Esq., Brentford.

The following paper was then read:—Mr. Smith commenced by describing the discovery of the tablets containing the text of the deluge, which date from the reign of Assurbanipal, King of Assyria, B.C. 668. These tablets were copies from more ancient tablets, which Mr. Smith placed 1600 B.C. The deluge text forms part of a series of legends belonging to the reign of a king named Izdubar. Mr. Smith described how Izdubar, falling ill, went to seek Sisit, the Xisuthrus of the Greeks, who was supposed to have been translated. The legend describes Izdubar as seeing Sisit, who, in answer to a question from Izdubar, relates the story of the flood. Sisit states that the gods revealed to himself the coming deluge, and commanded him to build a ship and put his family and all the seed of life into it; the ship was then to be launched into the sea.

Here there is a break in the document for fifteen lines. Where it again becomes intelligible Sisit relates how he finished the ark, coated it with bitumen, and placed his treasures and family, his servants, and the beasts of the field in it; he then gives the command of Shamas to him to enter the ark and shut the door, followed by his obeying the command and the commencement of the flood.

The flood is graphically described, and various deities are stated to have been engaged in causing it. After the description of the flood, the story described the stranding of the ship on a mountain in Nizir, east of Assyria, and the sending out from it by Sisit first of a dove, next a swallow, and last of a raven. The animals were afterwards sent out of the ship, and Sisit built an altar and offered sacrifices.

The account concludes with Sisit giving directions to Izdubar how to be cured of a malady, which directions he carries out, and then returns to his city, Erech.

After reading the translation of the inscription, Mr. Smith gave Cory's translation of Berosus and a comparison of the Bible account, the inscription, and Berosus.

At the conclusion of the reading of Mr. G. Smith's paper, the chairman, Sir H. Rawlinson, offered some remarks on the probable age of the Babylonian legend of the deluge. He showed grounds for believing that the historical chronology of Babylon ascended to a period at least 5000 years before the Christian era. There was a recorded date in the inscriptions of B.C. 2280 for the conquest of Babylon by the Medes, and the number of kings assigned by Berosus to the dynasty which preceded that event would place the commencement of the historical era in about B.C. 5150. The deified sage to whom Mr. Smith had given the provisional name of "Izdubar," and who in his search for immortality had learnt the legend of the deluge from Sisit, must be placed beyond the historical limit, but how much beyond it was of course impossible to say. The Greeks, who had picked up the early traditions of Babylon, appeared, however, to indicate a date by placing the Proto-Patriarch, from whom the Babylonians had acquired the knowledge of astronomy, astrology, magic, and genethlialogy, 6000 years before Plato, or 5000 years before the Trojan war—that is, above 1000 years before the commencement of the historical period. The character of this proto-patriarch, who by the Greek traditionists was sometimes named "Zoroaster," and was sometimes compared with the Biblical Nimrod, would seem also to correspond with the Izdubar of the inscriptions, though there was no possibility at present of bringing the names into relation. If Izdubar, the first civiliser of the Babylonians, lived about B.C. 6400, they would still have to ascend to a much earlier period for the age of Sisit, who was the hero of the flood, and from whom the legend professed to come. Sir Henry doubted very much Mr. Smith's readings of Sisit and Ubaratutu for the names of the ark-builder and his father, and would not believe those forms to be identical with Xisuthrus and Otiartes of Berosus. It was curious that the former name might also read Yamashid, "ruling the sea," and that the primæval sage of Babylon was actually named in the native traditions collected in Ibn Wakshi's celebrated work on the agriculture of the Nabathæans, Yanbu-shad, a title which certainly appeared to be identical with the Arian prototype, Yemo-shaito or Jemshid. This might be a mere coincidence; but there were many other points of contact between Arian and Babylonian tradition, and the subject certainly required investigation.

On the geography of the legend, Sir Henry remarked that the Nizir of the inscriptions exactly answered to the Ararat of the Bible; not to the northern mountain near Erivan, which had now usurped the title, but to the true Ararat of Assyrian and Armenian geography—namely, the precipitous range overlooking the valley of the Tigris to the north-east of Mosul. The particular hill of this range upon which, according to the local tradition, the ark had rested, and where its remains were supposed to be visible to the present day, had always borne the Arabic name of Júdí, which there could be no doubt was the representative of the name of Gûti, which was attached to Nizir in an Assyrian geographical list.

Sir Henry further expressed great confidence in the genuineness of the extracts from the work of Berosus, which had been preserved to us by Eusebius and other copyists, since the proper names, under their Greek disguise, could usually be identified with the original Babylonian terms. It was certain that Berosus in describing the deluge must have had under his eye the original legend that had been translated by Mr. Smith, though perhaps there was some mistake in assigning the legend to Xisuthrus: and it could further hardly be doubted that the account in Genesis was the version of the same legend which had been carried away by the Abrahamic colony in their original migration from Ur of the Chaldees to Harran and Palestine.

ZOOLOGICAL SOCIETY OF LONDON.

December 3rd, 1872, the Viscount Walden, F.R.S., president, in the chair.—The secretary read a report on the additions that had been made to the society's collection during the months of October and November, amongst which were particularly noticed a nippon ibis (*Ibis nippon*), and other birds, presented by R. Swinhoe, Esq., F.Z.S., H.B.M. consul at Ningpo, China. Mr. P. L. Sclater exhibited a nest of the tigereta (*Milvulus tyrannus*), containing one egg of that bird and nine of the parasitic *Molothrus bonariensis*, which had been sent to him by Mr. W. H. Hudson, C.M.Z.S., of Buenos Ayres. Mr. H. E. Dresser, F.Z.S., exhibited a series of skins of eagles of Europe and India. After a careful investigation, Mr. Dresser had come to the conclusion that three good species had hitherto been included under the name of the imperial eagle, four under that of the spotted eagle, and two under the name of the tawny eagle. Mr. Dresser pointed out the various plumages and localities of these species.

Professor Owen, F.R.S., read a paper on "The Asteology of the Marsupialia," being the fourth of his series of papers on this subject. The present communication contained a description of the trunk and limbs of the wombats *(phascolomys)*. A communication was read from Mr. R. B. Sharpe, F.Z.S., entitled "Contributions to the Ornithology of Madagascar." A communication was read from Dr. J. E. Gray, F.R.S., on "The Fossane of Madagascar (*Fossa d'Aubentonii*)," of which animal the British Museum had recently received specimens. A second communication from Dr. Gray contained notes of a terrapin from British Columbia, which had been presented to the British Museum by J. K. Lord, Esq., F.Z.S., as the *Actinemys marmorata* of Agassiz. A communication was read from Sir Victor Brooke, Bart., F.Z.S., giving the description of a new species of antelope from the river Gambia, living in the society's menagerie, which he proposed to call *Nanotragus nigri-caudatus*. A communication was read from Dr. A. Günther, F.Z.S., containing notes on a hitherto unpublished drawing in the Buchanan-Hamilton collection, representing *Barbus beavani*. Three short communications were read from Mr. Andrew Garrett, of Tahiti, in which he gave descriptions of two new species of *Separatista;* two new species of *Caecum*, from the Viti Islands; and a new species of *Scissurella*, from the Panmotu Islands.

The next meeting of the society for scientific business will be held at the society's house in Hanover Square on Tuesday, the 7th of January, 1873, at half-past eight o'clock, p.m., when the following communications will be made:—1. Dr. Bowerbank, F.R.S.: "Contributions to a General History of the Spongiadæ. Part IV." (Received 1st November, 1872.) 2. Dr. Bowerbank, F.R.S.: "Report on a Collection of Sponges found at Ceylon by E. W. H. Holdsworth, Esq." (Received 6th November, 1872.) 3. Mr. A. H. Garrod: On "The Value in Classification of a Peculiarity in the Anterior Margin of the Nasal Bones of some Birds." (Received 3rd December, 1872.)

INSTITUTION OF CIVIL ENGINEERS.

At the Fifty-fifth Annual General Meeting held on December 17th, 1872—T. Hawksley, Esq., President, in the chair—it was stated in the report that, since the last annual meeting, the council then elected to conduct and control the business of the institution had been mainly occupied in following in the footsteps of their predecessors, by whose exertions the society had been brought to a most flourishing condition,—a condition which had been well sustained during the past year.

Reference was in the first place made to the completion of the premises in the occupation of the institution, which, since their enlargement, had not previously been considered sufficiently dry to allow of their being decorated. The works had been carried out by Messrs. J. G. Crace and Son, under the direction of Mr. Thos. H. Wyatt, and the result was regarded as very satisfactory. The introduction of cloth in the lower compartments of the walls of the meeting room had contributed to subdue the resonance from the hard surface of the parian cement, and had sensibly improved its acoustic properties. The alterations effected during the vacation had included a great addition to the bookshelf accommodation in the library. This addition was rendered necessary by the recent large accessions—either by presentation, by bequest, or by purchase. It was thought that provision had now been made for the next six or seven years, on the supposition that the present rate of increase continued. The library contained about eleven thousand volumes, almost exclusively relating to mechanical science and engineering, and as a technical collection, devoted to a special subject, it was believed to be without a rival either in the United Kingdom or abroad.

From an enumeration of the topics discussed at the ordinary meetings, it was seen that there had been an opportunity of eliciting opinions on various branches of practice; and a reference to the two volumes of "Minutes of Proceedings," issued during the recess, would show that many members had availed themselves of the opportunity to place on record their views and experience on the several matters brought forward. To the authors of some of the communications on which these discussions were founded, medals and premiums had been awarded, viz.: Telford medals and premiums to Messrs. B. Leslie, Carl Siemens, W. Bell, J. H. Latham, M.A., and G. Gordon; Telford premiums to Messrs. F. A. Abel, F.R.S., and B. Britten; and the Manby premium to Mr. C. Andrews.

In addition to the ordinary meetings, a short series of special meetings had been organised to enable the students to read and discuss papers among themselves. The members who presided on these occasions had reported that the aptitude, the intelligent discrimination, the apparent sustained attention throughout, which characterised those taking part in and present at these proceedings, were a pledge that in the future the students would continue to exert themselves for their own individual improvement, as well as for the benefit of their fellow-students. For the essays contributed for reading on these evenings Miller prizes had been bestowed upon Messrs. O. Brown, A. T. Atchison, B.A., J. Addy, A. E. Preston, and W. P. Orchard, B.E. On the invitation of the president, a party of eighty of the students—the largest gathering of the kind that had ever taken place—in the course of the summer visited the Leicester Water Works, when Mr. Hawksley pointed out and minutely described the peculiarities of the undertaking. For the opportunity thus afforded for acquiring professional knowledge, as well as for the liberality with which the whole programme was conceived and carried out, the warmest thanks of the Institution are eminently due to the president.

During the past session 17 associates were transferred to the class of members. The elections had comprised 3 honorary members, 22 members, and 115 associates, and two associates were restored to the register, together 142. On the other hand the losses by death, retirement or erasure, amounted to 45, so that the effective increase was 97, being at the rate of nearly $5\frac{1}{2}$ per cent. in the twelve months. There had been 64 admissions to the class of students attached to the Institution, while 30 were removed from the list, representing a gain of 34, or at the rate of 18 per cent. in the past session. There were on the books on the 30th November last 16 honorary members, 752 members, 1115 associates, and 237 students, together 2120, as compared with 1000 ten years ago. In order to show the progress of the Institution from its foundation, on the 2nd January 1818, to the present time, a table had been compiled, from which it appeared that, disregarding the students, the elections into the corporation in the eleven quinquennial periods, had been 59, 106, 104, 138, 313, 192, 247, 226, 309, 637, and 693, together 3024, while the number of such elections still remaining on the books were respectively 2, 7, 8, 29, 87, 65, 115, 146, 245, 558 and 667, making a total of 1929, or very nearly two-thirds of the gross number elected.

The deaths recorded during the year have been: The Earl of Lonsdale, honorary member; Nathaniel Beardmore, David Reid Edgeworth, Joseph Walter Gale, John Mortimer Heppel, Durand Kershaw, Andrew Murray, C.B., William Scamp, Richard Smallman, and Henry Johnston Waylie, members; and James Bagnall, Edward Banfield, Joseph Baxendale, John Van Norden Bazalgette, Edward Ladd Betts, Edwin Bidder, Charles William Dixon, Thomas Dunn, John Samuel Enys, Charles Haslett, Thomas Howard, Robert Jobson, Frederick Marrable, Edmund Morel, Christopher Pattison, Augustus Siebe, William Sykes, Robert Harry Inglis Synnot, and Arthur Valentine, associates.

The abstract of receipts and expenditure as certified by the auditors, showed that the current subscriptions alone, £5643 15*s*., had exceeded the whole of the disbursements, £5586 11*s*. But the income proper had really amounted to £6574 10*s*. 8*d*., the fees, and building and publication funds on election, and life compositions to £1294 4*s*. 6*d*., and the dividends on trust funds to £411 2*s*. 3*d*., together £8279 17*s*. 5*d*.: whereas the expenditure on the general account, including the cost of the Minutes of Proceedings, less received under that head, had been only £5221 18*s*. 11*d*., and for premiums under trust, £249 18*s*. 9*d*. A sum of £2908 18*s*. 9*d*. had been invested in the purchase of 1338 London and North Western, and of £1500 North Eastern Railway Companies Four per cent. Debenture Stocks. The late Mr. Thomas Howard, who was for thirty-seven years an associate, had bequeathed to the Institution the sum of £500, the interest of which he directed to be applied for the purpose of presenting a prize for a treatise on the uses or properties of iron, or for the invention of some new and valuable process relating thereto. This bequest had been paid to the treasurer, and had been invested in the purchase of £551 16*s*. 6*d*. New Three per Cents. The nominal or par value of the funds belonging to the corporation was £14,994 1*s*. 8*d*., and of the trust funds under the charge of the Institution £13,389 13*s*. 2*d*., while the cash balance amounted to £270 15*s*. 1*d*., making a total of £28,654 9*s*. 11*d*. as compared with £25,373 3*s*. 4*d*. at the date of the last report. After the reading and adoption of the report, the premiums were presented by the president. The cordial thanks of the meeting were unanimously accorded to the president for his zealous efforts to promote on all occasions the interests of the Institution and of its members. The thanks of the meeting were likewise given to the vice-presidents and other members of the council, for their cooperation with the president and their constant attendance at the meetings; to Mr. Charles Manby, honorary secretary, and to Mr. James Forrest, Secretary, for the manner in which they had performed the duties of their offices, and to the auditors of accounts for their services. The scrutineers of the ballot (to whom a vote of thanks was passed by acclamation) announced that the following gentlemen had been elected to fill the several offices in the council for the ensuing year:—Thomas Hawksley, president; John Frederic Bateman, Thomas Elliot Harrison, George Willoughby Hemans, and George Robert Stephenson, vicee-presidents; James Abernethy, Sir William George Armstrong, C.B., William Henry Barlow, Joseph William Bazalgette, C.B., George Berkeley, Frederick Joseph Bramwell, George Barclay Bruce, James Brunlees, Sir John Coode, Charles William Siemens, Sir Joseph Whitworth, Bart., and Edward Woods, members; and James Timmins Chance, M.A., David Forbes, and James Grierson, associates.

REVIEWS.

(*Continued from page* 7.)

Our author then passes to the effects of accumulation of chemical heat or the reverse in metals, showing that thermic metals repel heat and attract cold, and have a tendency to form change, that chemically athermic metals attract heat, and have but little tendency to form change, which is considered a heat effect, for the more a metal is heated or the hotter it is naturally, the more readily it will transform chemically, that thermic chemicals attract the athermic chemicals and *vice versa*, hence chemicals possessing strong chemical affinities must be in opposite states of chemical heat.

The fifth and sixth chapters treat of the three great steps of chemical combinations, attraction, heat changes, and heat equilibrium, as illustrated by the thermics of carbon, platinum, mercury, hydrogen, oxygen, nitrogen, chlorine, phosphorus, of cooling, or refrigeration, or athermising in chemistry, as seen in platinum and its congeners.

Dr. Hall then proceeds to consider the effects of heat equilibrium in chemistry, and demurs truly that equality or similarity in their heats produce repulsion of the ingredients of chemical compounds, and refers to the polarity of repulsion of the ingredients of compounds; and affirms the production of repulsion and attraction, like electric repulsion and attraction.

He afterwards passes to the consideration of true chemical affinities and aptitudes, chemical shapecraft, chemical activity, chemical inactivity, and morphigen.

Then follow the thermics of the combinations of acids and bases, whence we are conducted to the consideration of the decomposition of water by metals, showing that heat is then required to evolve hydrogen, good fuel being therefore needed. He shows what is good fuel, and that zinc not being good enough fuel requires further the combustion of an acid to decompose water, further that hydrogen and oxygen is the best fuel known.

This brings the reader to the second part of the treatise, which relates to the galvanic battery. We cannot do better justice than by quoting from that part of this treatise which makes a comparison between the old galvanic theory as compared with the new:—

Upon matters that can be decided by the crucial test of experiment, and about which, therefore, there cannot be a doubt, such as the electric states of the zinc and platinum plates and the fluid of the cell, the old interpretation and the new attempt in this disquisition are and must be at one. For both the old and the new theory and experiment make out that the zinc is negative, and the platinum and the fluid of the cell positive, as to heat and as to electricity. About the direction of the current between the zinc and the platinum plates, and the current's existence through the fluids of the cells, two things not so easy as at first sight seems of direct and satisfactory proof, the old and new interpretations are at complete variance. By the new interpretation proposed in these pages, the current of the principle in the galvanic cell passes *from* the zinc *to* the platinum, exactly the reverse of the old ideas. But the new theory seems to me, of course, the more reasonable. For we find the zinc of the galvanic cell, according to every theory, old or new—better still, according to experiment—is in the minus state, which means, if it means anything, that something has been subtracted from galvanic zinc. Galvanic zinc has always the sign of subtraction attached to it. What has become, then, of this something that has been so subtracted from the galvanic zinc? Surely it must have gone somewhere.

To galvanic platinum, on the contrary, is attached always the plus mark, the sign of addition. Whence has come this something that has been added to the galvanic platinum?

By the new theory, the way of answering these questions is to suppose that which has been added to the platinum has been taken, through the wire, from the zinc: for the subtraction from the galvanic zinc and the addition to the galvanic platinum are synchron ous and equal, and we know that the platinum is quite as ready for the addition as zinc is for the subtraction; and, besides, an excellent means, the wire, exists for effecting the subtraction. In the old theory it is said that that which is subtracted from the zinc is in totality added to the *fluid* of the cell, and from the fluid it is added completely or in totality to the platinum. But this is impossible. For if we by this old theory analyse the electrics of a galvanic cell, we find that in it there are two metals; one zinc, negatively electric, and the other platinum, non-electric, both immersed or in contact with a fluid positively electric. In these circumstances, by all the known laws of electricity, all the electricity of the positive fluid must at once be discharged upon the negative zinc in contact with it. Not a particle of electricity can in this case find its aberrant way to the non-electric platinum. Positive electricity in contact with two metals, platinum and zinc—the first non-electric and the second negatively electric—will certainly, if electric laws lie not, not go to the non-electric metal platinum, but will be at once and in totality discharged into the negative metal zinc. So that, if the old theory is held, all the electric actions of a galvanic cell would be confined to electric discharges from the zinc to the fluid, and from the fluid back again to the zinc. But this does not correspond to the facts observed; is in direct opposition to the facts observed. By the new theory, it is clear that the effect of the disposition of matters in the galvanic battery is to render zinc when action commences, minus or negative, that is, to subtract something from zinc. It is evident, therefore, that before that action began zinc must have had the thing taken from it when the action was established; you cannot subtract one from nothing. Zinc of the battery must have had electricity or heat latent in it before action, in order to have yielded it during the action of the battery; and because platinum received the thing added to it so readily, there must have been rather a deficiency of the thing added in platinum. And this we know is the case, for we know by our axioms that zinc is a thermic metal, and has therefore heat, and platinum is an athermic metal, and therefore is deficient in heat. And all this but means that the positive state of platinum and the negative state of zinc are a second step or scene in the phenomena of the galvanic battery, the first step or scene being exactly the reverse—things commencing by zinc existing positive and platinum negative, thus—

First scene in the phenomena of the galvanic battery consists of a quantity of electricity, or heat latent in zinc, and deficient in platinum—zinc being thus plus, and platinum minus as to electricity or heat.

Second scene in the galvanic battery consists of zinc losing its latent electricity or conditional heat to change shape into oxidity or ashes, zinc thus getting the losing or subtraction sign of minus upon it—that is, becoming negative: and this lost zinc heat passes through the wire—its by far easiest way, and therefore only way, to the platinum, which thus gains heat or electricity, and acquires the increase or plus sign upon it, or becomes positive.

Third scene of the galvanic battery consists of this electricity's discharge from the platinum to the hydrogen of the fluid, and the equilibrium restored by the escape of the hydrogen.

In short, in the galvanic battery, by the new theory, the platinum is simply charged electrically by the zinc through the wire, the easiest way, and discharged by the hydrogen, which escapes forthwith from the field of action, and thus restores the equilibrium. And that the current comes from the zinc, and goes along the wire to the platinum, we have absolute ocular proof. For in the case of the two charcoal points, in what is called the "voltaic arc," it is that charcoal point that is connected with the burning zinc pole of the battery, and that therefore by the new theory first receives the heat—it is that very zinc-connected charcoal point that first becomes white hot or incandescent. By the new theory it must be so, for by that theory the heat must first reach the charcoal point connected with the burning zinc. Theory and fact are therefore in perfect accordance. The new theory says that that charcoal point that first receives the current, first shows it by becoming incandescent. The new theory says that that charcoal point which the heat current first reaches first becomes heated or white hot, and what the new theory says accords with what the fact indicates.

These views Dr. Hall supports by able argument and statement of illustrative facts; but we must warn our readers that although we have analysed this work at such length, and quoted much from its pages, we have by no means exhausted its contents. If they take any interest in the subject they must get the book and examine it for themselves.

APPLICATIONS FOR LETTERS PATENT.

(*Continued from page* 2.)

elastic fabric.—A. F. Shanks. Making cases or boxes of thin sheet metal, and in apparatus therefor.—H. A. Bonneville. Furnaces for burning lime, plaster, cements, ceramic productions, and for similar purposes (com.)—B. J. B. Mills. Improved process for cleansing cotton waste and fibrous substances saturated with oils and mixed with débris and other matters (com.)—R. Smith. Steam generators.—J. Allison. Planing wood or other material, and in the machinery or apparatus employed therefor.—W. C. Stiff. Metallic cop tubes or caps used in spinning.—W. Marriott. Manufacture of salts and oxides of lead, and in apparatus therefor.—A. M. Clark. Manufacture of stearic acid (com.)

On November 9th.—3324 to 3340.—R. J. Lees. Fuel Economisers.—T. Bowlas. Arrangements for damping in machinery employed in the spinning or doubling of cotton or other yarn.—C. Duggin. Fastening or securing window sashes (com.)—A. Harris. Breech-loading small-arms.—C. Lund. Cutting instrument for opening metal boxes or cases.—G. S. Newman. Means of and apparatus for signalling between carriages or vehicles of railway trains, and in means or appliances for connecting the wires of adjoining carriages or vehicles.—A. C. Pelly. Manufacture of peat fuel (com.)—A. Prince. Apparatus for feeding steam boilers and raising water (com.)—A. Prince. Apparatus for raising water (com.)—J. Grantham. Tramway carriages.—T. H. Rushton. Machinery for doubling and winding yarn.—C. de S. Marie. Tanning hides and skins.—P. Newall and J. Barker. Steam traversing leather roller for butts, bends, bellies, and heads.—F. Fleming and J. Milner. Apparatus for flattening or shaping wire to be used in the manufacture of wire cards and reed wires for looms for weaving.—W. R. Lake. Compressed air motor (com.)—J. T. Hopkinson. Window-sash fastenings.—C. E. Zindars. Pneumatic signalling and communicating apparatus.

On November 11th.—3341 to 3356.—T. W. Kennard. Indicating the height of the water in steam boilers.—S. Alley. Apparatus for measuring, pumping, or obtaining motive power from liquids.—A. Barr. Motive-power engines to be worked by water.—J. B. Stearns. Electric telegraphs (complete specification).—E. Cogswell, N. Wilkins, and J. B. Wilkins. Fulling machines.—R. Hanson. Steam engines.—W. P. Wilson. Apparatus used in the manufacture of gas, which improvements are also applicable to other purposes.—R. Field. Sewage tanks and in the means of effecting the intermittent discharge of liquid from them or other vessels by syphons.—R. Kendall. Dish or stand for holding pressed or cooked meats, Stilton cheese, and such like provisions.—H. H. Murdoch. Tanning hides and skins (com.)—T. Shutt and E. Brooks. Apparatus for economising fuel.—G. Ash. Stoves or fire-grates.—P. Brimelow. Warping or beaming mechanism.—F. Macken. Machinery or apparatus for preparing and spinning wool and other fibrous substances (com.)—H. Y. D. Scott. Apparatus to be used in the treatment of sewage deposits and other like substances.—J. A. Manning. Treatment of human fœcal matters and in the apparatus or means employed therein.

On November 12th.—3357 to 3371.—P. Brimelow and S. Southerst. Railway coupling mechanism.—J. Pinkerton. Signalling on railways and in apparatus or means employed therefor.—G. S. Hare and C. Stuart. Method of and apparatus for stopping and plugging the tubes of steam boilers.—E. P. H. Vaughan. Mariner's compass (com.)—L. C. Fulton. Steam engines.—L. Banks. Manufacture or composition of fuel.—R. Bewley. Boiler fittings, also partly applicable for other purposes.—H. Hillman. Sewing machines.—W. R. Lake. Improved kaleidoscope (com.)—F. W. Waide. Water-waste preventors.—H. C. Ash. Ice safes.—C. A. Randall. Printing telegraphic apparatus and in the arrangement of the circuits to be used in connection therewith (partly com.)—W. Richardson. Machinery for burring or cleaning, opening and sorting wool and other fibrous materials.—A. P. Price. Annealing of wire (com.)—V. D. de Michele. Manufacture of Portland cement, and in apparatus to be employed therein, and for other purposes.

On November 13th.—3372 to 3388.—W. T. Read. Cocks or taps for bottling.—H. E. Towle. Fluid motors for driving sewing machines and other small or light machinery or apparatus (partly com.)—R. Punshon. Shovels or instruments for feeding fires with fuel.—A. B. Verrier. Stoves, kitchen ranges, kitcheners, and fire-grates of various kinds.—J. Buchanan, jun. Centrifugal drying and cleaning machines.—J. Lyall. Looms for weaving.—F. N. Target. Preserving food, and in the means or apparatus employed therein.—J. E. Palmer. Production of copies of photographic pictures, and in shading and colouring the same.—H. Jones. Improved life-belt.—J. Farmer. Musical instruments.—E. A. Cowper. Separating the fibres of paper pulp, and apparatus therefor.—H. W. Whitehead. Machinery for burring wool and other fibrous substances.—C. H. Murray. Chain pumps.—R. S. Taylor, jun. Construction of ships or other vessels (com.)—J. H. Johnson. Pipe joints (com.)—J. H. Johnson. Construction of ships or vessels (com.)—A. M. Clark. Bolt-threading and nut-tap machinery (com.)

On November 14th.—3389 to 3399.—B. J. B. Mills. Machinery for cleansing, scouring, or smutting grain and seeds (com.)—B. Brown. Construction of bolsters for the spindles of machines used in spinning and doubling cotton and other fibrous materials.—G. Laurence. Improvements in knickerbockers.—W. R. Lake. Reaping and mowing machines (com.)—G. Clark. Preserving animal and vegetable articles of food, and in vessels, apparatus, and appliances for such preservation.—T. White. Construction of ships and vessels, and also in the construction of railway and other carriages.—W. C. Church. Safety-valves and self-acting apparatus for preventing explosions of or injury to boilers or generators containing steam or other fluids, parts of which improvements are applicable to steam and hydraulic valves.—H. Schildberg. Construction of velocipedes.—A. M. Clark. Air-heating furnaces or apparatus (com.)—A. M. Clark. Baling press (com.)—A. M. Clark. Boring and drilling machines (com.)

On November 15th.—3400 to 3415.—H. E. Harrold. Coupling for the shafting of machinery.—J. Tenwick. Construction and in the form of anchors for ships and vessels.—D. K. West and W. West. Apparatus for pressing cotton and other materials, and for securing bales, part of which invention is applicable to other machinery.—M. J. Roberts. Engine governors and apparatus connected therewith.—J. C. Mewburn. Apparatus for purifying boiler feed water (com.)—J. Ré. Machinery for manufacturing horse-shoes (com.)—E. T. Hughes. Arrangements and apparatus for weighing the contents or loads of waggons or other vehicles having springs (com.)—J. Steel. Improved personal indicator for offices.—T. Marsh. Apparatus for lubricating the spindles employed in machinery for preparing, spinning, and doubling cotton and other fibrous substances.—D. Stanley. Method of and apparatus for obtaining and applying motive power.—W. E. Prall. Combination and arrangement of devices for supplying the tanks and tenders of locomotives with water (complete specification.)—W. E. Newton. Stench traps and in apparatus for making the same and other curved or partly curved articles (com.)—G. Alsing. Treatment of nightsoil and other refuse matter.—T. Ryder and G. Ryder. Construction of machinery for forging.—A. M. Clark. Machinery for moulding india-rubber and other plastic materials (com.)—G. T. Bousfield. Machinery for cutting and polishing glass, gems, marble, stones, and other similar hard substances (com.)

On November 16th.—3416 to 3429.—B. Miller. Machinery or apparatus for punching, cutting, shearing, and planing iron or other metals.—F. Hahn. Manufacture of steel and malleable iron, and in furnaces therefor (complete specification.)—A. Turner. Manufacture of elastic fabrics.—T. J. Smith. Apparatus for facilitating the stoppage of carriages, carts, and other vehicles upon common roads (com.)—J. Z. Kay. Pipe joints.—T. Bagley. Varnish.—J. H. Johnson. Refrigerating or freezing apparatus, parts of which improvements are applicable for regulating the flow of fluids generally (com.)—T. C. Blyth. Stoves for heating apartments, halls, and other like places.—E. T. Hughes. Elastic goring for boots and shoes (com.)—G. H. Chinnock. Sheet-metal cans.—I. Gregg. Bricks.—R. B. Jackson. Racks for bottles.—S. Holman. Apparatus for raising and lowering heavy bodies, parts of which improvements are applicable to the raising and forcing of fluids generally.—D. Cockburn. Barrows (com.)

On November 18th.—3430 to 3444.—J. S. Pode. The regulation of the flow of liquids from infants' feeding bottles.—T. Blocksage. Means for promoting the combustion of fuel or for lessening the production of smoke in fire-grates or stoves.—E. P. H. Vaughan, F.C.S. Drawing pens (com.)—W. Rose. Hollows and rounds and bead and moulding planes.—C. D. Chauncy. Apparatus for cleaning out the grooves of tramway rails.—J. Foster. Feeding and delivery apparatus applicable to printing and folding machines.—J. Weir. Apparatus to be used as a safety valve or in connection with other safety valves.—H. E. Wagner. Paper and parchment.—W. R. Lake. Inkstand (com.)—J. C. Morgan, H. Macaulay, and W. Waide. Improvements in water-waste preventers (complete specification.)—F. J. Cheesbrough. Skate fastening (com.)—A. M. Clark. Walking sticks (com.)—S. W. Worssam. Parquetry.—J. L. Norton. Drying wool, hay, straw, and other materials, and for bread and biscuit-baking.—J. Tall. Floors and other parts of buildings and in warming and ventilating the same.

On November 19th.—3445 to 3457.—R. Hornby. Treating fatty materials in combination with various kinds of pitch, alkalies, and oil, also in the treatment of animal, vegetable, and mineral oils for lubricating purposes.—C. D. J. Seitz. Apparatus for and method of treating wood and other similar substances for the manufacture of half stuff and paper.—H. Grosvenor. Manufacture of bookbinders' cloth and imitation leather.—W. R. Sykes and F. R. Francis. Working railway signals, in registering the arrivals and departure of trains, and in the means or apparatus employed therein, part of which invention is applicable to other registering purposes.—R. Davison. Brewing apparatus. R. Snape. Looms for weaving.—C. L. Siecinoski. Preparation of autographic tracing paper, and in the fluid employed in connection with the same. J. Furness. Metallic packing for piston-rods, valve-rods, and other similar purposes (com.)—J. Riley. Roofs and other parts of buildings.—J. M. P. O'Callaghan. Means or apparatus for lowering and raising ships' boats.—E. Sang. Spinning machinery. —J. T. Holcroft. Waste-water preventers for water-closets, lavatories, urinals, and other like purposes.—C. W. Meiter and T. W. Smith, and C. Minasi. Tobacco pouches.

On November 20th.—3450 to 3473.—J. M. Zamoyski and W. Jackson. Constructing (with reference to independent axles and crank shafts) railway locomotives and other engines, railway carriages, vans, and trucks, as well as tramway carriages.—P. Kirk. Rolling mills.—A. Morgan. Purifying and amalgamating gum resins, including Kauri gum.—A. Fraser. Apparatus for composing types.—J. Thomas. Supporting and protecting telegraph wires.—E. G. Johnson. Apparatus for perforating, piercing, or punching paper, cardboard, and other materials, especially applicable to the cancelling of or producing indications on railway tickets and other passenger tickets.—E. Hills and B. Biggs. Deodorising and purifying sewage and other excrementitious matters, and in obtaining certain useful products therefrom.—S. Hemingway. New or improved means or apparatus for packing dry soap, starch, corn flour, baking powder, mustard, tea, coffee, or any other article in a powder or granulated state.—T. C. Selby. Protection of the chest and lungs of animals used for riding or draft purposes from inclement weather.—T. D. Tully and J. T. Robinson. Making gas and water supply pipes, equally applicable as a preventative against fire.—J. A. C. de Latouche. Ordnance and other fire-arms, and in apparatus connected therewith, part or parts of such improvements being applicable to other purposes.—A. Dockray. Machinery or apparatus for roving, spinning, twisting, and laying fibrous material. —W. G. Brunner. Annealing and cleansing the surfaces of iron or other metals (com.)—S. Bourne. Improvements in or applicable to screw and other sorts, spindles, and shafts, and in nuts, knobs, or handles and fasteners suitable to be used with bolts, spindles, or shafts. —C. E. Harrison. Heating apparatus.—C. W. Harrison and A. H. Harrison. Apparatus for charging or impregnating atmospheric air with vapour of hydrocarbon liquids.

On November 21st.—3474 to 3491.—S. F. Van Choate. Telegraphing.—J. M. Ure. Measuring taps or apparatus for drawing off and measuring liquids.—C. J. Appleton. Sewing machines. —P. Jensen. Steel (com.)—C. W. Siemens. Furnaces and apparatus for melting, refining, and working out glass (partly com.)—H. S. Maurel. Ruling paper.—C. O'L. L. Prendergast. Enabling a passenger in a train (railway) communicating with the guard and engine-driver at one and the same time.—E. T. Hughes. Motive-power engine (com.)—E. Pfeiffer. Lock or fastening for bags, satchels, and other like articles (com.)—S. Johnson. Hop-straining cask preserver.—A. McKenzie. Apparatus for operating the moving heads of carriages.—W. E. Gedge. New or improved apparatus for washing linen in laundries and elsewhere, and also for various other purposes (com.)—J. H. Johnson. Seed or grain separators (com.) —W. B. Thompson. Governors for marine engines.—A. M. Clark. Breech-loading fire-arms (com.)—C. A. Blogg. Improved water-waste preventer cistern.—W. Brooks. Joining the ends of pipes or tubes (com.)—C. J. Ball. Machinery and apparatus for drilling and boring holes.

On November 22nd.—3492 to 3503.—C. E. Wetton. Portable appliances in magneto-therapeutics.—J. A. Barker and D. Jones. Portable adjusting points for tramways.—J. S. Grierson and R. Philips. Apparatus for applying bronze or dust colours upon paper or other surfaces.—C. O'L. L. Prendergast. Protecting cheques from forgery.—J. C. Morton. Coupling or connecting together passenger or other carriages or trucks on railways. (Complete specification.)—T. H. Cotton. Fuel to be used as a substitute for and to economise coal, and the means of applying same to feed steam-boiler and other furnaces where steam can be obtained. —D. Greig and G. Greig. Steam and other multiple furrow ploughs.—J. H. Bass. Shields or collars for preventing the escape of oil or other lubricating fluid from railway axle-boxes. —T. Brown. Machinery for the manufacture of tires for wheels, and also for the manufacture of hoops and rings for various purposes.—J. H. Player. Utilising waste products obtained in the manufacture of phosphorus, and in the manufacture of certain metallic compounds containing phosphorus.—T. A. Howland and C. G. McKnight. Manufacture of gas, and in apparatus therefor. (Complete specification.)—W. Birch. Treating horny and other analogous animal substances for the purpose of converting them into an elastic substance, to be used in place of whalebone bristles, and for other purposes for which such elastic substance may be applicable.

On November 23rd.—3504 to 3523.—E. Ensor. Steam-boiler and other furnaces, and in the means for supplying the same with fuel.—R. F. L. Jenner. Manufacture of Dinas fire-bricks. —H. B. Young. Apparatus for raising, lowering, and holding Venetian and other blinds, part of which improvements are also applicable to various other analogous purposes.—R. Brydon, J. S. Davidson, and T. A. Warrington. Machinery or apparatus for drilling, boring, or cutting rock or other hard substances.—R. B. Stewart. Heels of boots and shoes.—A. Baumann. Steam engines. (Complete specification.)—G. Haseltine. Improved lever and screw press (com.) (Complete specification.)—E. Ludlam. Sifting cinders and other similar kinds of material that may require sifting.—C. Owen. Electrical intercommunication between passenger and guard, guard and guard, and guard and engine-driver.—W. Wright. Apparatus for preventing the waste of water, applicable to waterclosets and other purposes. —J. Lamacroft. Preparing paper for transmission by post or otherwise, without the use of wrappers or envelopes.—S. Osborn. Finger beams for reaping and mowing machines, and in apparatus therefor.—J. Howard and E. T. Bousfield. Steam cultivating machinery.—T. Price and A. L. Saniscovsky. Better manufacturing of tin and terne plates.—S. B. Allport. Breech-loading small-arms.—J. Smiles. Breech-loading small-arms.—J. C. Ramsden. Severing or dividing double-piled fabrics.—J. B. C. A. Papier. Prevention of smoky chimneys, giving at the same time perfect ventilation for houses, ships, lanterns, and public buildings.—W. H. Thompson, E. Harris, and G. French. Skate.—C. W. Harrison. Apparatus for heating water and generating steam.

On November 25th.—3524 to 3540.—R. Hadfield. Improved method for fixing and setting wheels truly upon their axles and shafts, and for making such wheels, axles, and shafts more particularly applicable to corve, colliery tramway, and other similar wheels.—J. Mitchell. Cretaceous hydrocarbon fuel.—J. U. Askham. Manufacture of angles in iron, steel, and other metals.—J. Farran. Fancy weaving.—M. Howe. Heels for boots and shoes.—D. Curror. Filtration and purification of fluids, and in the manufacture of manure.—J. Jones. Steam boilers.—R. Faulkner. Applying and fixing dry colours on paper, canvas, and other porous surfaces, and in the means employed for this purpose.—E. L. Ward. Pipe for smoking tobacco.—J. R. Belford. Manuring, disinfecting, and deodorising.—G. Thorneloe. Dip pipe, forming part of gas apparatus for use in making gas.—G. Chambers. Heels for boots and shoes.—Hon. F. A. Wellesley. Torpedoes (com.)—J. C. MacDonald and J. Calverley. Printing machinery.—J. Needham. Manufacture of dagger, table, dessert, fish, and carver knives and forks.—S. Hallam. Apparatus for raising or forcing fluids and liquids.—G. G. Tandy and W. Strondley. Lamps.

On November 26th.—3541 to 3558.—T. North. Railway axle-boxes, also applicable to all kinds of railway stock (com.)—J. A. Forrest and W. W. Hayes. Waterclosets.—A. C. Dingwall. Sewing machines.—C. G. Y. King. Pressure and vacuum gauges.—A. Chiffray. System of printing at the same time one or more colours on both sides of a cloth, and to produce simultaneously some ribs squaring with those colours. —B. V. Benquet. Motor moved by weight. —A. J. Stevens. Steam and other motive-power engines.—W. Young. Electric telegraph apparatus, partly applicable for printing and producing stereotyping and printing surfaces. —J. White. Pistons.—R. Porter. Brake apparatus for wheeled vehicles.—F. Pigall. Scissors. —F. M. Lyte. Industrial manufacture of acetate of alumina, and the treatment of the resulting products (com.)—H. S. Ford. Courier or travelling bag.—J. H. Johnson. Apparatus for disengaging ships' boats (com.)—W. C. Church' Safety and other valves.—J. Bates, J. W. Dixon. junior, and W. Buttery. Apparatus for extracting caps from the base of breech-loading cartridge cases.—J. J. Bodmer. Manufacture of bricks, blocks, and other objects of blast-furnace slag.—J. E. Keirby. Elastic packing for pistons and piston-rods of steam-engines, pumps, rams, and other similar purposes.—E. Quadling and W. May. Machine for manufacturing metal tubes. (Complete specification.)

On November 27th.—3560 to 3573.—G. C. Ogle. Construction of reaping and mowing machines, which improvements are also applicable to land rollers, seed drills, and other agricultural implements drawn by horses.—W. Smith. Looms for weaving.—T. West. Equilibrium steam valve.—J. Ashbury. Seat fittings of railway carriages and other vehicles, applicable also to the cabins or saloons of steam and other ships or vessels.—J. Osborn and G. Nicholas. Locking the wheels of railway carriages.—H. Bezer. Means to facilitate the calculation of the distances covered by each person travelling in any conveyance from any point in the journey to any point in the journey, or for the full journey.—F. S. Foley. Manufacture of collars, cuffs, wristbands, shirt-fronts, and other similar articles.—E. W. Marcus. Means and apparatus for counteracting sea motion in passenger and other vessels, and thereby preventing sea sickness. — W. H. Rodden. Pitchforks. (Complete specification.)—J. Dodd and R. Buckley. Mules for spinning and doubling.—E. Ensor. Drying bricks, tiles, pottery ware, and other like goods, and in the means employed therefor.—A. M. Clark. Machinery for grinding and polishing (com.)—A. M. Clark. Combined printing, pressing or calendering, cutting, pasting, and folding machine (com.)—C. F. Boutherin.—Folding or winding up weft, twist, gimp, galloon and ribbon lace, and similar articles, and in boxes in connection therewith.

On November 28th.—3574 to 3588.—W. Young. Furnaces, grates, and stoves.—T. J. Ditchburn. Machinery or apparatus for the treatment of vegetable productions containing fibre.—C. D. Abel. Artificial fuel blocks (com.)—J. F. Smith. Self-acting gates or sluices and weirs for the prevention of the overflow of water from rivers or watercourses.—A. Wardroper. Umbrellas and sunshades.—R. Hitchcock. Apparatus to be used for removing tubes from steam boilers. —E. Taylor. Shirt collars.—R. Bell and T. Bell. Oil lamps.—F. Burgess and J. Robertshaw. Spinning and twisting fibres.—G. Haseltine. Sewing machines and in mechanism connected therewith (com.) (Complete specification.)—E. Kaulbach. Means of and apparatus for checking and preventing motion on board ships at sea in order to allay sickness.—F. M. Lyte. Treatment and purification of crude phosphoric acid, and in the production of soluble phosphates; also for the manufacture of phosphorus, and the treatment of certain residues resulting therefrom, and phosphate of alumina (com.)—G. Haseltine. Printing-telegraph apparatus (com.) (Complete specification.)—W. Betts. Capsule and machinery for producing the same.—A. V. Newton. Manufacture of sugar, and in apparatus to be used therefor (com.)

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